



# Neches River Bridge Feasibility Study

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Final Report – June 2013

Rail Division

# Neches River Bridge Feasibility Study

prepared by

TranSystems Corporation

In association with

URS Corporation

RJRivera Associates Inc.

for

The Texas Department of Transportation

Rail Division

FINAL Report

June 2013



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## **Executive Summary**

This Report and summary is organized around four sections; background and context, existing conditions, projected conditions and concludes with the evaluation of alternatives. At this time a preferred alternative has not been identified. The material presented in this report is intended to inform decision-makers regarding the basic elements of physical and financial attributes. The next step is to coordinate with the various stakeholders - including the public - to arrive at a mutual consensus involving a multitude of institutions and agencies and to identify a future development plan.

## **Background and Context**

The City of Beaumont, Texas is on the coastal plain of Texas about 30 miles inland from the Gulf of Mexico. The City is the county seat of Jefferson County, Texas. Beaumont with the cities of Port Arthur and Orange form the Golden Triangle, a major industrial area on the Gulf Coast. There is currently only one railroad bridge with a single track crossing the Neches River in Beaumont. The bridge is owned and operated by the Kansas City Southern (KCS) Railroad which shares operating rights across the bridge with the Union Pacific Railroad (UPRR), BNSF Railway Company (BNSF) and Amtrak. The study area for this report is bordered on the north by Interstate 10, on the east by the eastern city limits (extended to intersect IH-10 in Orange County), on the south by Washington Boulevard, and on the west by primarily 4<sup>th</sup> Street. A significant portion of the study area is shown in the oblique aerial photograph in Figure I.1. A significant element in the region's economy is the Port of Beaumont which is located in the study area at the existing river bridge crossing.

**Figure ES.1 – Beaumont, Texas**  
with Port of Beaumont in foreground, KCS Neches River Bridge  
in mid-ground and Interstate 10 bridge in background



This study evaluated the feasibility of rail corridor system improvements at or near the existing Neches River rail bridge crossing in the City of Beaumont, Texas. The Neches River is a navigable waterway and the railroad lift bridge is raised in order to allow river traffic to pass. The purpose of the study is to:

- evaluate rail movements and operations within the study area,
- identify opportunities to increase rail efficiency,
- analyze potential alternatives and improvements to the existing bridge and rail alignment, and
- determine the physical and financial viability of such potential improvements.

Within the scope of this study, the elimination of the existing structure was not considered feasible. Also while the evaluation considers the potential effects upon the environment, this report is not an environmental document. The project's no-build scenario is utilized only to define the project's purpose and serve as the baseline for the alternatives. Nonetheless as a feasibility study, the focus is upon the technical, financial and political aspects of build alternatives.

Pertinent reports reviewed as background information for this study included:

- Texas Rail Plan, November 2010
- Amtrak Gulf Coast Service Plan Report, July 16, 2009
- Rail Access to the Port of Beaumont, April 2005
- Gulf Coast High-Speed Rail Corridor Evaluation, November 2004
- Metropolitan Transportation Plan (MTP)

These reports are relevant because they address all modes of transport while focusing upon rail transportation issues both for freight and passenger rail service within the State. The reports also contain regional and local information that may affect where potential rail alignments might be located.

## **Existing Conditions**

This section provides an overview of socioeconomics and environmental resources in the study area as well as an inventory of existing rail transportation, its operations in the Beaumont region and the development of a Rail Traffic Control model to simulate existing and projected conditions. The social and environmental resources inventoried include:

- Population and Households
- Income and Race
- Employment
- Water Resources
- Wetlands and Floodplains
- Threatened and Endangered Species
- Archeological and Historic
- Land Use Conditions

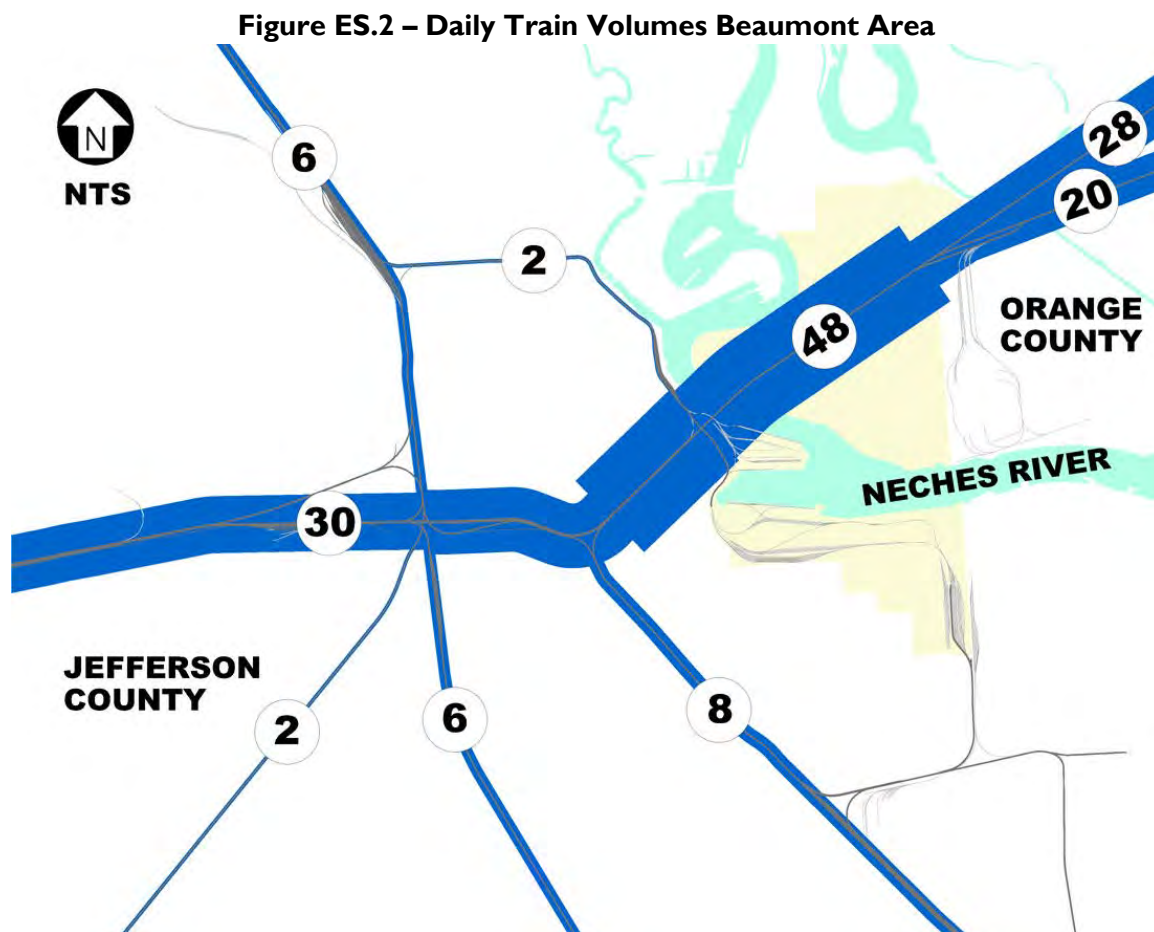
There are three Class I railroads operating in the Beaumont area; the Kansas City Southern (KCS) Railroad, the Union Pacific Railroad (UPRR) and the Burlington Northern and Santa Fe (BNSF). Each of these railroads systems are described beginning with a depiction of each freight rail carrier's national system and then moving into the regional system. Elements of the rail corridors studied are included with the identification of key at-grade crossing and service provided to local industries as well as access to the



Port of Beaumont. For this study, the rail serving the Port is focused upon the Port's Interchange Yard. The Port of Beaumont's Master Plan focuses upon the Port's Orange County facilities which could build out in excess of 450 acres. Amtrak provides intercity passenger rail service in the Beaumont Texas area via the Sunset Limited.

### **Rail Corridors and Operations**

The primary east-west rail corridor through the Beaumont area includes the Neches River rail bridge, a vertical lift span bridge that allows river traffic to pass under the bridge. The bridge is in the rail-locked position until a navigation request is made to raise the lift bridge, generally to a requested vertical clearance. Information supplied by the United States Coast Guard (USCG) indicates approximately 400 lifts per year in 2011. Data from KCS in 2012 indicates 7 lifts in a six day period which is consistent with the USCG's annual lifts. While requests for bridge openings can occur at any time, most occur during daylight hours. The bridge raising can result in some train delays. The delays are more pronounced when trains are traveling in the same direction across the bridge as adjacent trains must be separated by two signals in order to prevent a train from stopping on the bridge. Typically the bridge stays open to river traffic between 15 and 30 minutes. The daily train count across the Neches River bridge ranges between 40 to 50 trains based upon daily train movements in the FRA's crossing inventory. Figure ES.3 represents that information as a band of varying thickness.



Another important issue regarding train traffic through Beaumont is that close follow-up movements are restricted by crew changes in each direction. Both the UPRR and KCS have crew changes in Beaumont which occur on the railroad's main lines. Finally, yard capacity and yard operation's efficiency have a direct impact on the rail system operations. Several yards are located in and around the Beaumont area and include:

- Port of Beaumont Interchange Yard
- KCS's Chaison Yard and Vidor Siding
- UPRR's South, East and Beaumont Yards
- BNSF's Beaumont Yard.

## **Projected Conditions**

This section discusses rail forecast and operations in the forecasted year 2035 under the no-build scenario. An assessment of operations and various improvement concepts were developed and assessed. A key element with any improvement concept is the crossing of the Neches River with regards to meeting the river navigation criteria. The parameters for different bridge crossing types (lift vs. fixed) are discussed followed by reviews of some potential alignments. The 2035 rail forecast includes an overview of rail traffic at both a national level as well as specific to the region based upon the Texas Statewide Rail Plan. Potential impacts of implementation of the Gulf Coast High Speed Rail (GCHSR) passenger initiative are discussed. The no-build scenario's future rail system operations were analyzed utilizing the existing rail network and committed improvements, such as the new switch into the Port of Beaumont.

Rail Traffic Controller (RTC) is a computer program created by Berkeley Simulation Software, LLC, which simulates train operations over a railroad network. Variations can be made in network track layouts such as new rail lines, train composition and schedules, and operating rules and constraints, which allow for the testing and assessment of modifications. RTC is used by most North American Class I railroads to evaluate and plan their operations and in turn determine capital expenditures. The Base (Modified) RTC model estimates that under current conditions 287 trains operate during a typical week through the project study area. This translates to approximately 40 to 50 trains per day crossing the Neches River. Forecasted growth for the number of trains expected to be operating weekly in the Beaumont area by 2035 was determined utilizing a three percent (3%) compounded annual growth rate. The 3% growth rate is reasonable given the population growth forecasted for the State of Texas and the expected increased level of cross-border trade on a national basis. In addition, this is the rate that other recently completed freight studies used. Train traffic is projected to essentially double from the base condition to an estimate of 87 trains per day crossing the Neches River.

In the forecasted year with no improvements to the rail network, the average speed across the entire study network declines by about one-third from 15.0 mph to 10.6 mph. The forecasted train traffic results in the quadrupling of the delay ratio and the delay in minutes per 100 train miles. The forecasted delay hours increase at an even more significant rate, approaching eight times the value of delay hours under existing conditions. Essentially, the application of the forecasted train volumes to the existing rail network results in significant congestion. However, this is consistent with other studies regarding future levels of service for freight rail at the national level.

## **Developing Options**

The development of options can be thought of in two basic parameters:

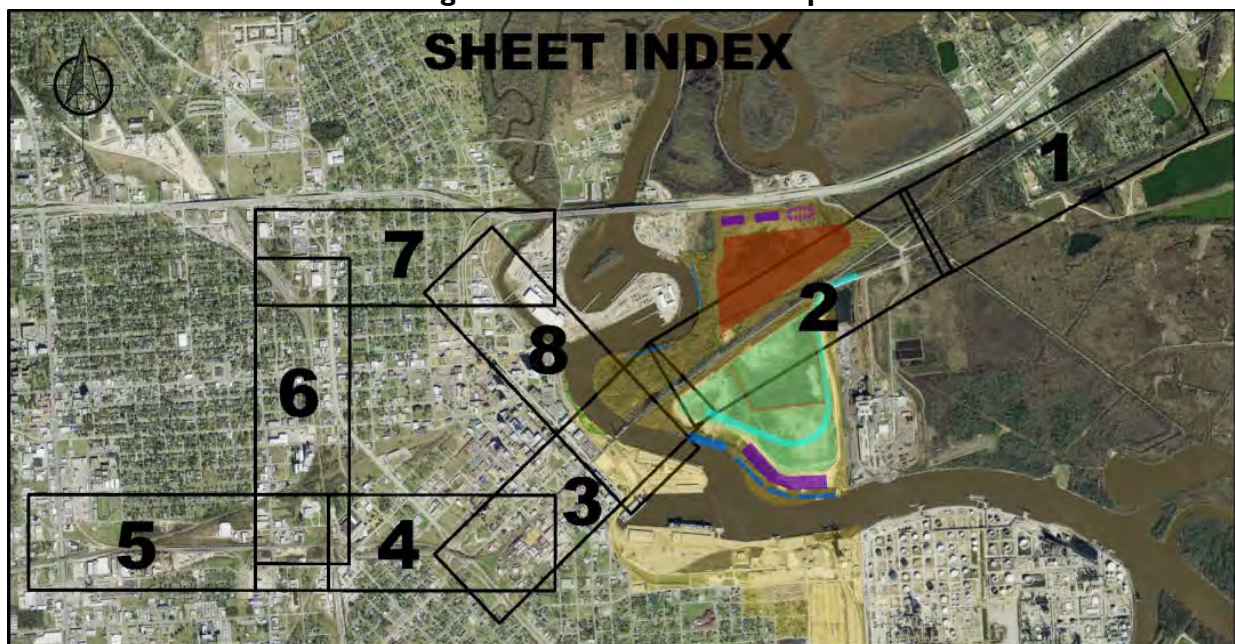
- I. the development of bridge type (stationary or lift) and

2. the development of bridge crossing locations (along existing or on new alignment).

The determination of bridge type also influences the location of the bridge crossing. A stationary bridge type could consider three levels; a high level, a mid-level and a low-level. The high-level bridge would accommodate a vertical clearance at the maximum height (150 feet) which would meet the USCG's recommended navigation clearance for the Neches River. A mid-level bridge would have a vertical clearance that would accommodate the majority of river navigation. This report assumes that the mid-level bridge would have a 50 foot vertical clearance similar to the IH-10 crossing of the Neches River. A low-level crossing assumes a lift bridge with a minimum 13 foot river navigation vertical clearance in the closed position (to mimic the existing bridge vertical clearance).

A multitude of options were considered and screened. Concepts of high-level structures (with a vertical clearance of 150 feet) were considered but found to be both physically and financially impractical. Concepts for a lift bridge located south of the existing KCS bridge would have significant impacts on river navigation and the increase in the number of lifts would adversely affect rail operations. And while consideration of a former rail corridor is philosophically often a reasonable approach, the former Southern Pacific alignment through Downtown Beaumont is heavily developed with numerous street crossings. Creating an elevated rail corridor through Downtown Beaumont would have significant property and visual impacts. The corridor or alignments studied are summarized in Figure ES.3 and in the appendix.

**Figure ES.3 –Sheet Index Map**



Design aspects to accommodate the GCHSR were also considered and include, as part of a Phase 2 component of the GCHSR study, a proposed rail line along the existing UPRR-KCS rail corridor on the north side of the existing rail alignment. This concept is reflected by illustrating a third main west of the Gulf Coast Lines (GCL) junction, located between UPRR's East Yard and the Neches River bridge, through UPRR's east yard and continuing further westward. In Orange County, a proposed rail line is also shown in this study along the existing UPRR-KCS rail corridor on the north side of the existing rail

alignment which requires a crossing of the KCS rail. Because of the extensive existing right-of-way width on the north side between the Neches River bridge and the KCS-UPRR split at Tower 31, approximately 1 mile east of the Neches River bridge, design options were considered to accommodate a crossing with the proposed additional rail line on the north side. In order to provide a level at-grade crossing, the new rail alignment must cross at a tangent and then begin its horizontal curvature. This geometric design may necessitate minor additional right-of-way acquisition. Another option could be grade separation, though obviously this has cost implications. Considerations may even need to be given to the potential for double track alignments coming together along both the UPRR and the KCS routes at the KCS-UPRR split.

Three build alternative crossings of the Neches River were evaluated. These include an alignment along the existing river crossing corridor as well as new alignment alternatives with different types of river bridge crossings; stationary or lift span. Essentially these were determined to be the best of the options considered for alignment location and bridge type. The three alternatives are:

- Add capacity adjacent to existing KCS alignment with a new lift bridge
- Add capacity on new alignment adjacent to Interstate-10 with a stationary bridge, and
- Add capacity on new alignment along Pine Street corridor with a new lift bridge

## **Evaluation of Alternatives**

The evaluation of transportation impacts for the alternatives included a review of river, rail, and highway operations. The rail operations are based upon the output from the RTC model while highway operations focus upon the output from GradeDec.net at the selected key at-grade rail-highway crossings. River impacts were based upon the degree of obstruction to navigation traffic. All alternatives offer the option to route trains via either the existing rail lines or the alternate route, depending upon circumstances. In effect when combined, the existing route and proposed alignments create at least two main tracks over the Neches River, and to some extent three, between the UPRR Beaumont Yard and the KCS-UPRR split. This added capacity offers more flexibility than just the existing route alone.

The rail operation measures include system route miles, total system train miles, total system weekly trains, system average velocity, total weekly system train delay, and a system delay ratio. The evaluation of an improved river crossing shows an increase in average speed over existing single track operations. However, there is no change to the delay ratio and only minor decreases in delay hours and minutes, 10% and 20% respectively. The effects of the double track are more prominent (ranging from 40% to 55% reduction in delay measures) when comparing potential projected volumes to operations on a single track.

To review potential impacts to vehicular traffic, the alternatives studied were subdivided into five rail segments for assessment via GradeDec.net. Three of the five rail segments are essentially evaluated under future conditions (increased train and vehicular volumes) while the other two rail segments have the potential to be directly affected by the alternate alignments under consideration. In summary, of the at-grade crossings evaluated for grade separation, only the crossing at Martin Luther King Parkway approaches a benefit close to the probable construction costs. This occurs only with increased and diverted train traffic associated with the new rail alignment alternative adjacent to IH-10. The existing low volume service line today would not reach a level to suggest the need for a grade separation.



**Figure ES.4  
Existing Alignment Evaluated  
(New lift bridge adjacent to existing)**



**New Alignment Evaluated  
(Stationary bridge Interstate 10)**



**New Alignment Evaluated  
(Lift bridge Pine Street)**



The evaluation of sustainability impacts includes a review of potential environmental and social impacts. Elements from the transportation and implementation impacts cross over to provide additional input on such factors as property impacts and transportation delay which has an effect upon air quality and energy use.

The potential for environmental impact is associated with the implementation of an alternative's infrastructure. The key issues are potential environmental impacts as well as the complexity of permits for the alternative. Several of the attributes described under the existing conditions such as population, households, income, race and employment are represented by the surrogate of property impacts by land use categories. Residential impacts would affect population and households, while commercial and industrial impacts would affect employment and income. Impacts to water resources including wetlands and floodplains are indicated by assumed areas of potential right-of-way. Often these natural areas are habitat and thus served as a surrogate for threatened and endangered species for this study. Specific sites that could be affected are identified for archeological, historic and community facilities including public lands and parks. Impacts to these attributes are represented by four degrees of impact ranging from no impact to low impact to medium impact to high impact. Superfund is the name given to the environmental program established to address abandoned hazardous waste sites. There is one Superfund site within the Study Area named International Creosoting located at 1110 Pine Street, Beaumont, Jefferson County. The new IH-10 alignment runs through the middle of this superfund site.

The evaluation of implementation impacts includes a review of probable construction costs as part of a cost effectiveness assessment. Property impact costs, while not specifically estimated at this time, are discussed in broader terms as an influence upon project development. The construction costs for the alignment

concepts have been developed based upon major elements such as the river crossing bridge as well as the length of structural approach spans. These bridge approach spans can be very long considering the potential height of the proposed rail, topography, and local soil conditions. For alignment comparisons, the quantity and associated costs of the rail were estimated based upon new rail alignment and existing rail alignment. The cost of improving adjacent to the existing rail alignments also considered whether the proposed track was within the existing rail right-of-way or adjacent to but outside existing rail right-of-way. The costs of track was varied depending upon upgrade of existing track, new track on-grade, new track on fill (typically up to 16 feet), new track on structure, and new track on river bridge. For this study, it was assumed that only a single track would be added for those new alignments. However, the bridge costs are based on providing the ability to construct a future track. In order to be consistent with the structural availability for a second track, the earthwork for the future second track is also included in the estimate. If necessary, new rail sidings and connections are quantified. At this stage, the rail traffic control and signaling system as well as improvements to crossing devices at highways are included in the contingencies. The costs only account for construction activities in 2012 dollars. The costs do not include right-of-way acquisition, design, permitting or construction inspection costs, or any annual maintenance costs. The potential for such costs should be considered when comparing alignments, particularly on those alignments that have significant property impacts.

## **Summary of Alternatives**

Four alternatives have been assessed under forecasted 2035 conditions. The projected “no-build” alternative was analyzed to establish a baseline for comparison. This alternative establishes the fact that Beaumont’s rail network would benefit from having additional rail lines at the Neches River crossing. In addition to the “no-build” alternative, three “build” alternatives were evaluated that involved improving capacity by providing additional track as well as exploring operational issues associated with the lift bridge over the Neches River. The three alternatives concentrated on improving the existing rail route with 1) a new adjacent lift bridge, 2) a new rail alignment also with a lift bridge near the existing rail corridor, and 3) a new rail alignment with a fixed river bridge crossing north of the existing rail corridor. A brief summary of the pros and cons of each build alternative are provided below.

### Expand existing route to double track river crossing (lift bridge)

This alternative keeps the existing bridge in place and assumes it to be operational with a projected 16 lifts per week in the future scenario. In addition, a second lift bridge is considered immediately adjacent and north of the existing structure. While this alternative’s RTC model performance measures improve over the “no-build” conditions, the operations still show significant delays. Even with the double track operations, delays under the projected train volumes would be twice to four times as great as they are now. Some potential improvements to address this delay beyond the additional capacity over the Neches River could be a third main for the UPRR and is shown conceptually in the Alternatives Evaluated mapping. This alignment alternative does not intrinsically address the delays associated with the KCS-UPRR split at Tower 31. As the proposed improvements essentially remain adjacent to or within the existing rail corridors, impacts to the community are minimized. Costs for this improvement in the Beaumont area are estimated in 2012 construction dollars approach \$120 million.

### New Pine Street alignment (lift bridge over Neches River)

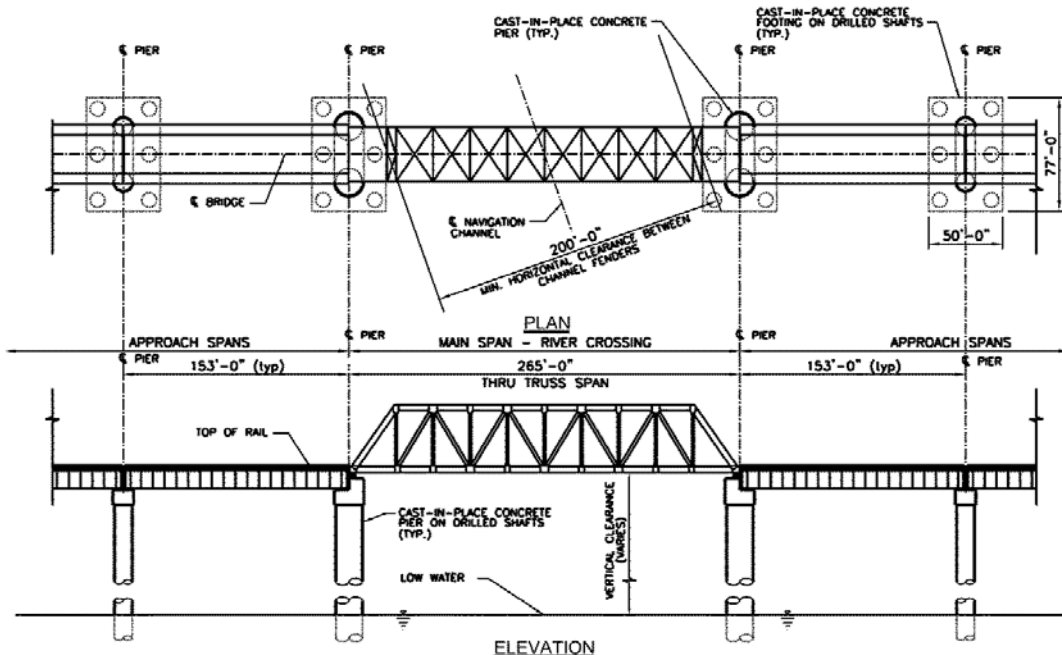
This alternative keeps the existing bridge in place and assumes it to be operational with a projected 16 lifts per week. The Pine Street alignment was initially tested through the RTC model with a potential fixed river bridge crossing. However physical limitations determined that the only practical fixed river bridge crossing lies immediately adjacent to the IH-10 corridor. Consequently it was determined that the Pine

Street alignment was the best new rail alignment with a lift bridge over the Neches River. Nonetheless, that new lift bridge location created its own set of design issues that result in additional costs compared to constructing an adjacent rail bridge to the existing rail's river crossing. The alignment's tie in on the west side is likely to create significant adverse impacts to a neighborhood with property acquisition as well as impacts to vehicular operations at critical at-grade crossings that will only add to the probable construction costs. This alignment alternative does not intrinsically address the delays associated with the KCS-UPRR split at Tower 31. Costs for this alignment are estimated in 2012 construction dollars approach \$170 million.

**New IH-10 alignment (fixed bridge over Neches River)**

This alternative keeps the existing bridge in place and assumes it to be operational with a projected 16 lifts per week. The new IH-10 rail alignment has potentially significant operational benefits by addressing two key issues: 1) the delays associated with the lift operations of the river crossings, and 2) addresses the grade separation of the KCS-UPRR split on the east side of the Neches River. However, the alignment tie in on the west side is likely to create significant adverse impacts to a neighborhood with property acquisition as well as impacts to vehicular operations at critical crossings that increase the probable construction costs. This alignment is located close to an EPA Superfund site. Costs for this alignment are substantial and are estimated in 2012 construction dollars approach \$240 million. While viewed from a railroad operationally viewpoint only, this new alignment is the best within this study area. The high degree of cost and probable impacts may be offset by any additional operational benefits.

**Figure ES.5 – Stationary Bridge General Plan and Elevation**



## **1.0 Background and Context**

This section describes the study area and elements immediately surrounding the Neches River Bridge crossing in Beaumont, Texas. It includes a listing of the various tasks associated with the feasibility component of the study. This section concludes with a review of pertinent previous reports with a summary of their relevant aspects to this study.

### **Study Area**

The City of Beaumont, Texas is on the coastal plain of Texas about 30 miles inland from the Gulf of Mexico. It is bordered on the east by the Neches River and on the north by Pine Island Bayou. The City is the county seat of Jefferson County, Texas. Beaumont with the cities of Port Arthur and Orange form the Golden Triangle, a major industrial area on the Gulf Coast. In 2010, Beaumont's population was 118,296.<sup>1</sup>

There is currently one railroad bridge crossing the Neches River in Beaumont. The bridge is owned and operated by the Kansas City Southern (KCS) Railroad that shares operating rights across the bridge with the Union Pacific Railroad (UPRR), Burlington Northern Santa Fe (BNSF) Railway and Amtrak. This bridge was constructed in 1941 and was operated on-site until 2004. In 2004, it became remotely operated from Kansas City.<sup>2</sup>

The study area is bordered on the north by Interstate 10 (IH-10), on the east by the eastern city limits (extended to intersect IH-10 in Orange County), on the south by Washington Boulevard, and on the west by primarily 4<sup>th</sup> Street. A significant portion of the study area is shown in the oblique aerial photograph in Figure 1.1. A map of the entire study area is shown in Figure 1.2.

A significant element in the region's economy is the Port of Beaumont which is located in the study area at the existing river bridge crossing. Due to the significant volume of maritime trade of petrochemicals, the US Customs District - that includes the Port of Beaumont - was ranked 6<sup>th</sup> in the nation in terms of total cargo volume in 2002.<sup>3</sup> The Port mainly handles wood products, pot ash, grain and similar bulk items as well as petroleum and chemical products. Military shipments are an important and growing source of business for the Port as well, making the Port the second largest military seaport in the world.<sup>4</sup>

The main vehicular entrance gate for the Port of Beaumont is located at the intersection of Main and Franklin Streets. Vessel access is provided via the Sabine-Neches Waterway, a 40-foot deep federally maintained channel. Ships and barges have free access to the Port via Sabine Pass, the Port Arthur and Sabine-Neches Canals, and the Neches River. The Port contains more than one linear mile of open wharf space, eight ship berths, 50 acres of open storage, and 600,000 square feet of transit sheds.<sup>5</sup>



**Figure I.1 – Beaumont, Texas**  
with Port of Beaumont in foreground, KCS Neches River Bridge  
in mid-ground and Interstate 10 bridge in background



The Port is currently expanding its Dreyfus Yard (seen in the foreground of Figure I.1) and constructing a new south connection to the KCS track that was planned for completion in 2011. In addition, over \$20 million in capital improvement projects, including a new railcar holding yard, have been made to improve operating conditions. The Port's existing interchange yard lies north of the mainline. As a result of planned track improvements, the Port plans to lease a portion of the yard to the City of Beaumont for redevelopment. See Figure I.3 for an image of the Port Master Plan concentrating on the Orange County facilities.

Figure I.2 - Neches River Rail Bridge Feasibility Study Area

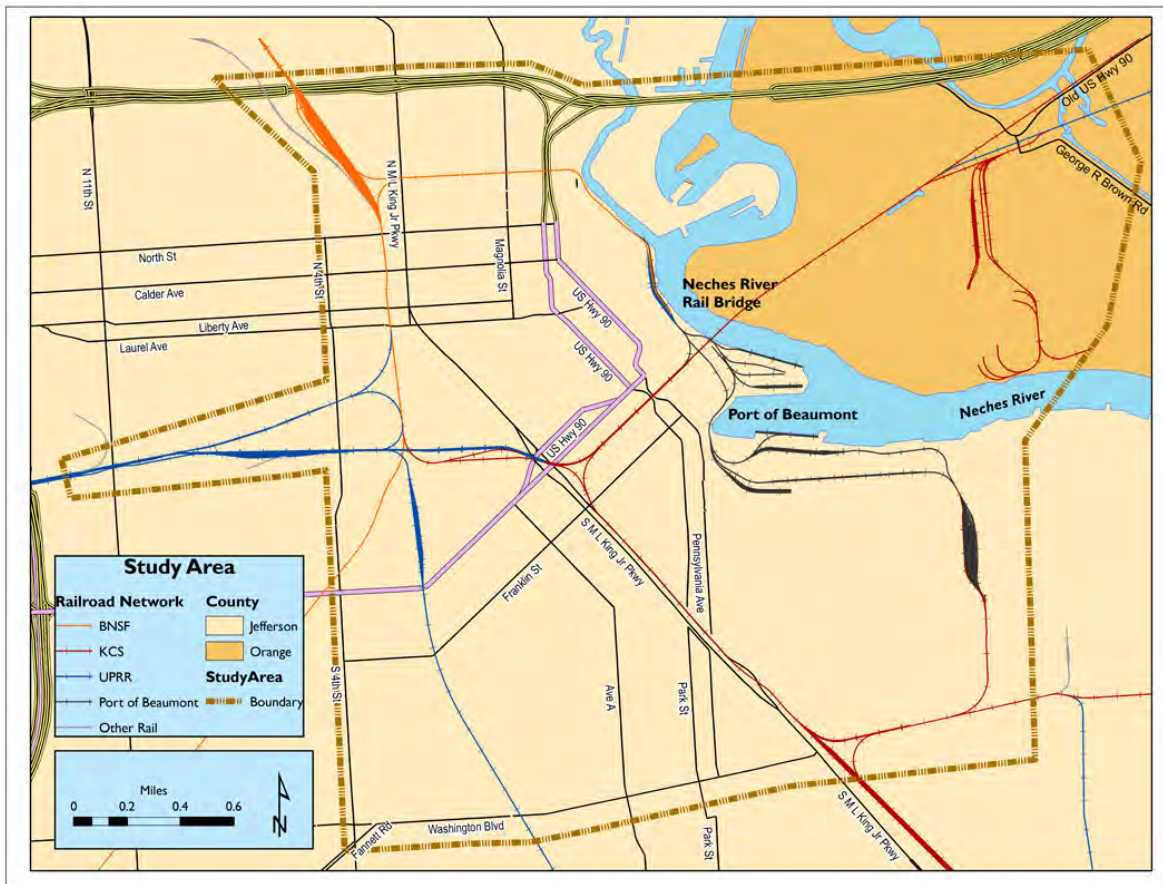
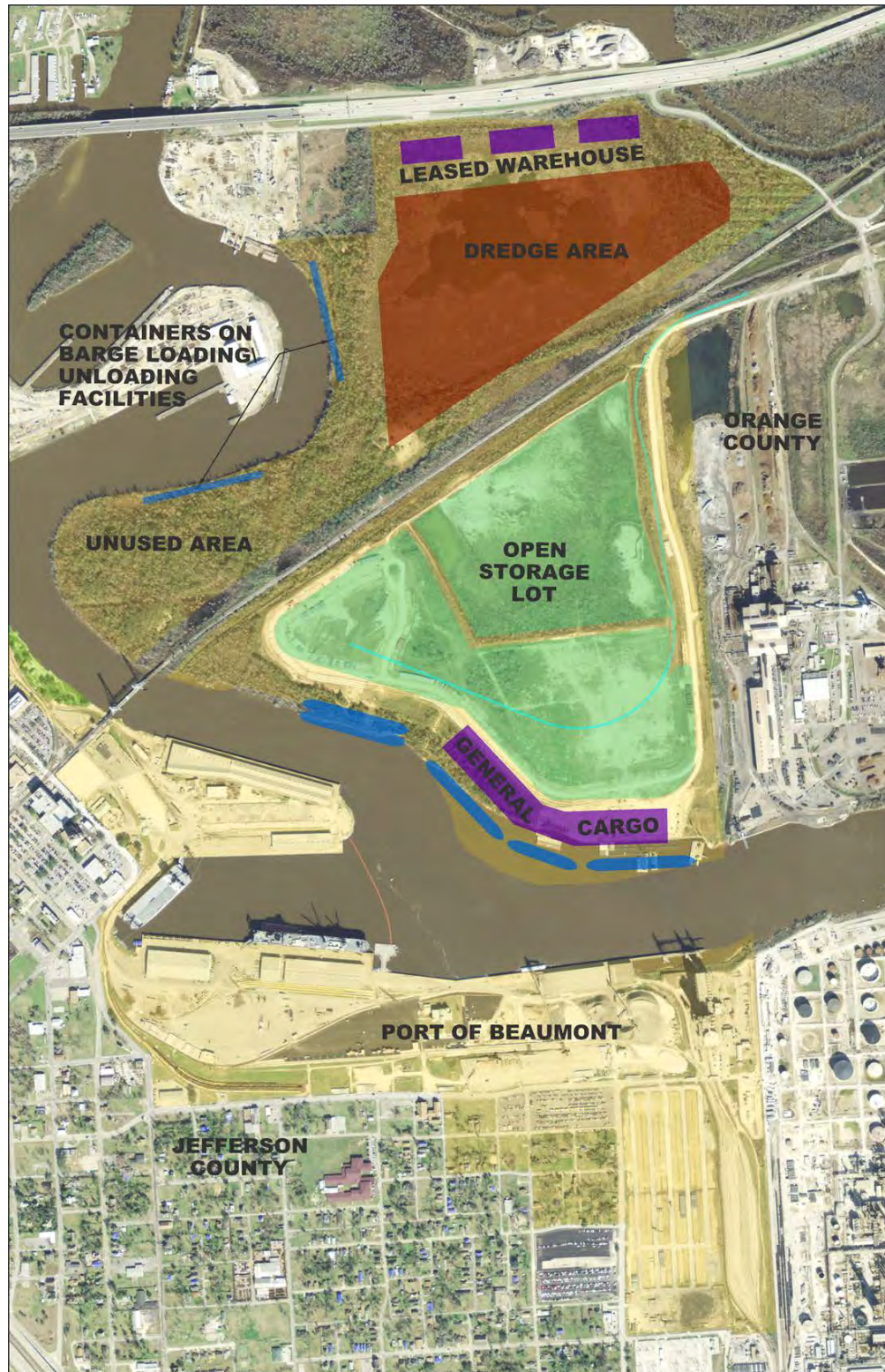




Figure I.3 - Port of Beaumont Master Plan



## **Project Description**

The study is to evaluate the feasibility of rail corridor system improvements at or near the existing Neches River rail bridge crossing in the City of Beaumont, Texas. This rail corridor serves a combination of Class I railroads including the Kansas City Southern (KCS) railway, the Union Pacific Railroad (UPRR), the Burlington Northern and Santa Fe (BNSF) Railway, and passenger rail operated by Amtrak. All of these railroads currently use the existing lift span bridge owned by the KCS. Approximately 40-50 trains a day cross the Neches River bridge.<sup>6</sup> The Neches River is a navigable waterway and the railroad lift bridge can be raised in order to allow river traffic to pass.

The purpose of the study is to:

- evaluate rail movements and operations within the study area,
- identify opportunities to increase rail efficiency;
- analyze potential alternatives and improvements to the existing bridge and rail alignment, and
- determine the physical and financial viability of such potential improvements.

This report documents the development and assessment of potential improvements and/or alternatives that could be presented to the railroads for consideration, including the evaluation of the financial, engineering, and operational viability of constructing a second river bridge crossing. These concepts were developed in coordination with the Port of Beaumont (POB) Master Plan and the Jefferson-Orange-Hardin Regional Transportation Study area Metropolitan Transportation Plan (JOHRTS MTP) and therefore should be consistent with Statewide planning practices.

The following is an outline of the study tasks. As part of the process, meetings with various stakeholders were conducted including but not limited to the City of Beaumont, the Port of Beaumont, the three major railroads operating in the region (KCS, UPRR and BNSF), as well as contacts with numerous state agencies and industries to obtain data.

### ***Inventory Existing Rail System***

- Review and summarize previous pertinent rail studies. Studies include the Texas State Rail Plan, Amtrak Gulf Coast Service Plan, TxDOT's High Speed Rail Study, Port of Beaumont as well as available studies from the Class I railroads.
- Meet with railroad representatives from BNSF, KCS, and UPRR to understand design alternatives, traffic volumes, forecasts, impacts, operating parameters and operating costs.
- Meet with the Port of Beaumont to understand their perspectives and objectives relative to the project.

### ***Conduct Freight Rail Operational Study***

- Meet with rail carriers who operate within the Beaumont area regarding existing traffic volumes and operational parameters.
- Collect available information on projected freight volumes for the study area from each railroad.

- Collect future population and employment projections from the State for the period through to the year 2035.
- Integrate data to develop a projection for future rail traffic volumes.

***Identification of Freight Rail Movement Constraints***

- Establish layout of track geometry that graphically represents the inventory assessed. A validated existing Rail Traffic Controller (RTC) model was used to estimate the constraints on the main line rail operations and efficiency resulting from:
  - Track, Bridge, and/or Signal deficiencies
  - Rail traffic congestion and yard utilization
  - Highway/Rail grade crossing conflicts.

***Develop Alternatives and Assess Feasibility for Rail System Improvements***

- Develop potential improvements at the Neches River crossing and necessary related main line track improvements, and associated track connections in the vicinity of the existing bridge. Potential track alignments to be examined include:
  - A new alignment immediately adjacent to the existing span.
  - A new approach span to new double track moveable span at the current location.
  - Up to four alternate alignments for new crossing consisting of a moveable span over the Neches River with fixed span approaches

Potential alternates for each new alignment to be examined include:

- Structure Type
  - EITHER a moveable span over the Neches River channel
  - OR a fixed span bridge that meets navigation requirements:
- Structure Typical Section
  - For alignments that connect Port of Beaumont property on both sides of the Neches River, the typical section will allow for rail double track. A 2-lane roadway section suitable for vehicles will also be examined.
  - For alignments that do not connect Port of Beaumont property on both sides of the Neches River, the typical section will only have rail double track.

Within the scope of this study, elimination of the existing structure is not considered feasible. Also while the evaluation considers the potential effects upon the environment, this report is not an environmental document. The project's no-build scenario is utilized to define the project's purpose. Nonetheless as a feasibility study, the focus is upon the technical, financial and socioeconomic aspects of build alternatives.

Utilizing the RTC Base Case model developed for the Texas Department of Transportation (TxDOT) as part of the Houston Regional study, forecasts and updated train operations for the various alternatives were prepared. A cost/benefit analysis based on order of magnitude costs for the construction of improvements, excluding right-of-way costs, was developed. Elements to be considered in the cost/benefit analysis included:

- Environmental:
  - Individual Permit or Nation Wide Permit: US Army Corps of Engineers, Galveston District.
  - Environmental Impact Statement or Categorical Exclusion
  - Potential Wetland Impacts
  - FEMA: A Conditional Letter of Map Revision (CLOMR) or Letter of Map Revision (LOMR)
  - U.S. Coast Guard and U.S. Army Corps of Engineers §10 Permits (Title 33, USC §403)
  - FAA Permit: Notice of Proposed Construction or Alteration.
  - Coastal Management Zone
  - Noise
  - Texas Land Office Permit
- Costs:
  - Probable costs including rail and structure costs as well as other associated transportation improvements to highways.
- Public Benefits:
  - Utilizing GradeDec.net, the Federal Railroad Administration's online planning tool, the public benefit for any proposed changes at key at-grade crossings was estimated.

## **Review of Previous Reports**

Pertinent reports were reviewed as background information for the study. A brief synopsis is provided.

### ***Texas Rail Plan, November 2010***

TxDOT developed its first rail plan in 2005 and updated in 2010. The purpose of the rail plan, known as the Texas Rail Plan (TRP), is to set policy, direction, and the vision for the state in compliance with both federal and state regulations as well as how it is to be integrated into the state's multimodal transportation system. Other key components of the plan are an inventory of the freight and passenger rail infrastructure and performing a needs assessment.

The plan states that forecasted growth in population will lead to increased vehicle miles traveled (VMT) and congestion on the highways. Increased VMT and congestion will result in environmental, social, and economic impacts on Texas. Increased population also generates additional demand for consumer products and the need for an efficient freight network. Maintenance and expansion of the existing rail network will be necessary to meet that demand.

Population growth also creates additional demand on the transportation system. The TRP focuses on the ability of passenger rail to serve the demand. Three elements point to the need to integrate passenger rail as another option for intercity travelers:

1. the social and interconnectivity of many of Texas' urban areas,
2. the increasing interest in rail transportation, and
3. the accessibility rail offers to those not willing or unable to drive or fly.



The TRP provides an inventory of existing freight and passenger services provides information on safety and security, and reports on financial opportunities for rail transportation in the State.

Relevance to this Feasibility Study:

- TxDOT's proactive approach to addressing rail transportation issues within the State
- A statewide forecast of freight
- Identification of rail congestion in the Beaumont area, and
- A methodology for assessing and rating rail projects across the State.

***Amtrak Gulf Coast Service Plan Report, July 16, 2009***

In 1993, Amtrak's *Sunset Limited*, which had previously operated between Los Angeles, California and New Orleans, Louisiana, was extended east from New Orleans to Jacksonville, Orlando, and Miami, Florida. This created a new transcontinental Amtrak route and brought passenger rail service to the Gulf Coast Region between New Orleans and Miami. In August 2005, however, *Sunset Limited* service east of New Orleans was suspended due to massive damage to rail infrastructure caused by Hurricane Katrina. The service on this segment of the *Sunset Limited* remains suspended today due to the cost and challenges associated with restoring this service.

The report detailed the alternatives that Amtrak is considering in restoring service between New Orleans and Florida. Amtrak initially evaluated 12 alternatives. Three were selected as preferred options for evaluation based upon projected ridership, revenue, operating costs, and operating loss. After analysis, three of the options are preferred and are listed below:

1. Restore tri-weekly *Sunset Limited* service between Los Angeles, California and Orlando, Florida.
2. Extend the daily *City of New Orleans* service, which currently operates between Chicago, Illinois and New Orleans, Louisiana, east from New Orleans to Orlando, Florida.
3. Implement daily stand-alone overnight service between New Orleans, Louisiana and Orlando, Florida.

The study recommended that Congress will need to determine if passenger rail service should be restored between New Orleans and Orlando and, if so, identify its preferred option for service restoration; and provide the additional funding for capital and ongoing operating costs that will be required to implement that option. Once these steps are taken, Amtrak will move quickly to initiate the actions required for service restoration.

Relevance to this Feasibility Study:

- If Option 1 is selected, the original *Sunset Limited* service between Los Angeles and Orlando will be restored, increasing the ridership on this route and potentially the need for additional service, and putting additional pressure on the Neches River bridge crossing. The *Sunset Limited* has a station stop in Beaumont, Texas.

***Rail Access to the Port of Beaumont, April 2005***

This is a study of rail infrastructure and operations around the Port of Beaumont. It assesses several plans for relieving local rail congestion and inefficient rail service that have been proposed by the Port of Beaumont and the KCS. The Port of Beaumont's motivation to improve local rail operations centers on three objectives:

- Increase port efficiency by replacing its current interchange yard;
- Improve port security for military shipments; and
- Team with the City of Beaumont to redevelop the existing Port interchange yards and thereby increase the local tax base and provide opportunities for economic development.

Three alternatives were proposed to improve rail access to the Port. Recommendations in the report are for all parties to consider a multi-phase approach to deal with the rail congestion. The first phase would be to build a proposed turnout from the south track of the KCS Main track into the Port as well as two rail yards within the Port. These improvements have been funded and are built with the exception of the connection. The second phase would be a detailed operational and economic analysis comparing uni-directional versus bi-directional train operations at the Port. The third phase would be to address the regional rail congestion problems which would include improving the Neches River crossing and various track improvements.

**Relevance to this Feasibility Study:**

- The Port of Beaumont is a critical rail user in the Beaumont area
- Access to the Port of Beaumont has a strong influence on rail operations in the region, and
- Anticipated growth at the Port necessitates the identification of immediate and long-range transportation improvements.

***Gulf Coast High-Speed Rail Corridor Evaluation, November 2004***

The report describes an evaluation of the proposed high speed rail corridor which traverses the southeastern portion of Texas from Houston to the Louisiana/Texas State Line near Echo, Texas. This route passes through the Texas communities of Dayton, Liberty, China, Nome, Beaumont, and Orange. Station stops were assumed in Houston and Beaumont. The UPRR owns most of the route with the exception of a short segment in the City of Beaumont where the BNSF, UPRR, and KCS railroads all cross the Neches River on an existing lift span bridge owned by the KCS. The report details:

- existing conditions along the corridor;
- proposed phase improvements;
- an order of magnitude cost estimate;
- ideas for a proposed fixed span structure crossing the Neches River; and
- reviews of equipment technology options.

Phase I of the improvements deal with upgrading the corridor to increase operating speeds up to 79 miles per hour (mph). The report details the necessary horizontal and vertical alignment, number of



grade crossings, bridge and drainage structures, environmental conditions, and any grading issues. The focus of Phase II is to expand the existing route capacity to facilitate both additional freight and enhanced passenger operations. Proposed improvements include double tracking throughout most of the corridor by connecting all of the existing sidings with additional track. The primary focus of Phase III is to upgrade the track and signal infrastructure to facilitate 90 mph operations. Primary improvements recommended include grade crossing and track improvements.

Relevance to this Feasibility Study:

- Passenger rail plays an important part in the nation and in this region, and it utilizes the Neches River bridge
- Rail improvements are needed to accommodate the Gulf Coast High Speed Rail throughout Texas,
- Within Beaumont, rail improvements are desired at the existing Amtrak station.

***Metropolitan Transportation Plan (MTP)***

In 1974, the Governor of Texas designated the South East Texas Regional Planning Commission (SETRPC) as the Metropolitan Planning Organization (MPO) for Jefferson, Orange, and Hardin Counties as shown in Figure 1.4. As the MPO, SETRPC is responsible for conducting comprehensive, coordinated, and continuing long range transportation planning in the three-county region. The SETRPC-MPO developed a 20-year long-range Metropolitan Transportation Plan (MTP) to accommodate the future needs of the three-county region and acknowledges the vital role that transportation plays in the region's social, environmental, and economic health.

This MTP covers the Jefferson-Orange-Hardin Regional Transportation Study (JOHRTS) area. The plan details projects contained in the “financially constrained” MTP but are not in the Transportation Improvement Program (TIP) or “locked years” sections (normally years 5-20 plus) and the “unconstrained needs” project (i.e. projects that are not funded during the first 20 years). These projects were identified by the public for having merit if funding should become available. As in other Texas urban areas, the JOHRTS area has experienced significant increases in traffic volumes and traffic congestion. In large measure, increased traffic and congestion are directly correlated to the region's growth in population which by 2030 is expected to reach approximately 435,700 persons. The population of the JOHRTS region was approximately 385,090 persons in 2000, with 252,051 in Jefferson County, 84,966 in Orange County, and 48,073 in Hardin County. Geography and regional travel patterns are contributing factors to escalating traffic between the three major cities (Beaumont, Orange, and Port Arthur) and surrounding communities.<sup>7</sup>

The Plan contains one major transportation improvement within the City of Beaumont:

IH-10: Proposed improvements to expand IH-10 from four to six lanes between Beaumont and the eastern county line in Orange are moving forward. Engineering and design studies for each of these phased construction projects are near completion – one section has been completed and a second section is currently under construction. TxDOT is still trying to secure funding to complete all the

projects along the entire link. Long-range plans also exist to expand the capacity of IH-10 in Jefferson County from four to six or eight lanes.

The Plan also details specific objectives in improving transit and non-motorized travel in the region.

Relevance to this Feasibility Study:

- The Plan addresses all modes of transport including freight (by truck, rail, water and air)
- Air quality attainment in the region needs to be addressed and will influence future transportation improvements, and
- Roadway improvement projects in the region may affect where potential rail alignments might be located.

**Figure I.4 - South East Texas Regional Planning Commission Area**



## **2.0 Existing Conditions**

This section provides an overview of socioeconomics and environmental resources in the study area as well as an inventory of existing rail transportation, its operations in the Beaumont region and the development of a Rail Traffic Control (RTC) model to simulate existing and projected conditions.

### **Socioeconomic and Environmental Resources**

The City of Beaumont is within Jefferson County, Texas and is part of the Metropolitan Planning Organization (MPO) known as the South East Texas Regional Planning Commission (SETRPC).

#### **Population and Households**

During the 1980's, Jefferson, Orange and Hardin counties experienced a decline in population and employment due to a downturn in the petrochemical industry. From 1980 to 1990, population in the region decreased by four percent. During the next decade (1990 to 2000), the region experienced a 6.6 percent increase in population growing to 385,090 people. Between 2000 and 2010, population growth slowed to one percent and in 2010 the three counties had a total population of 388,745. Population forecasts anticipate further growth of 11.6 percent for the SETRPC area between 2000 and 2030. Jefferson County is also forecast to grow by 11.6 percent.<sup>8</sup>

According to the 2010 U.S. Census, the City of Beaumont had a population of 118,296 which represents a four percent increase from 2000. This population had a median age of 32.8 years with 12 percent of the residents 65 years old or over.<sup>9,10</sup> Figure 2.1 displays households by block. Within the study area, the number of households tends to be low with a majority of single family households. Also note that limited residential development is located immediately adjacent to several of the railroads. Of the 43,569 occupied housing units, 56 percent are owner occupied and the remaining 44 percent are rented.<sup>11</sup> The median value of a house was \$90,900 in 2009 within the study area.<sup>12</sup>

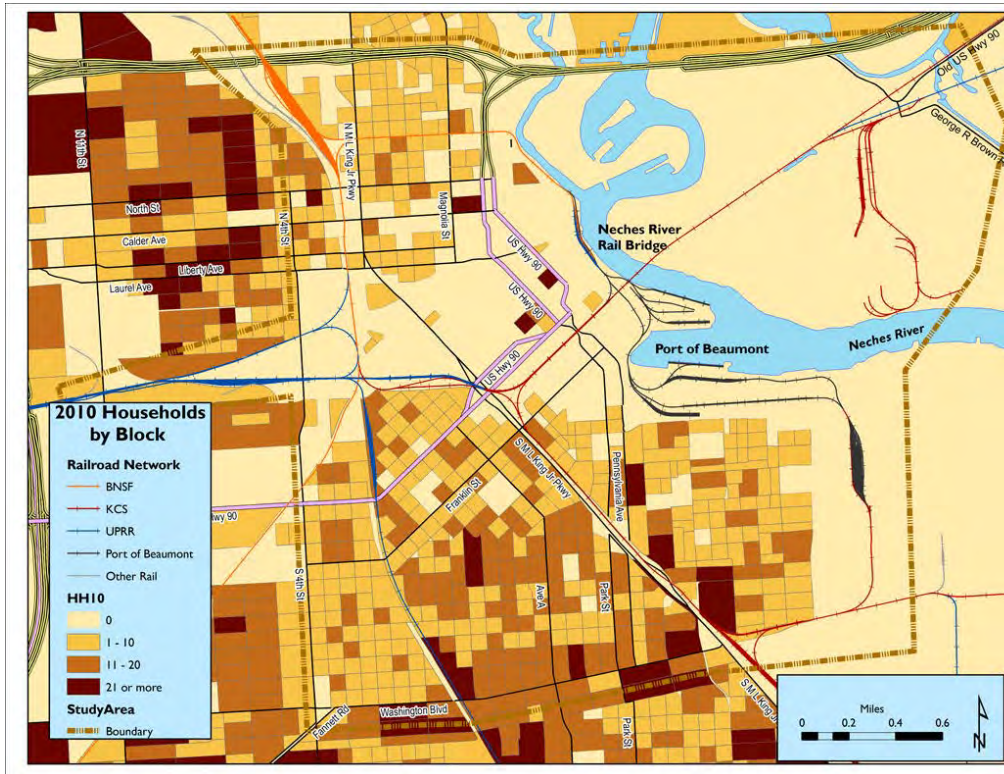
#### **Income and Race**

Economic characteristics show that in 2009 the median household income for the City of Beaumont was \$39,899 and the median family income was \$49,766.<sup>13</sup> Figure 2.2 displays the locations of families that are low to moderate income (approximately \$30,000 median family income or less). Note that the entire study area includes families with low to moderate income levels. In terms of racial composition, 48 percent of the residents are black, 43 percent are white, and the balance is a mixture of other races. Figure 2.3 displays the distribution of the non-white population in the study area.<sup>14</sup>

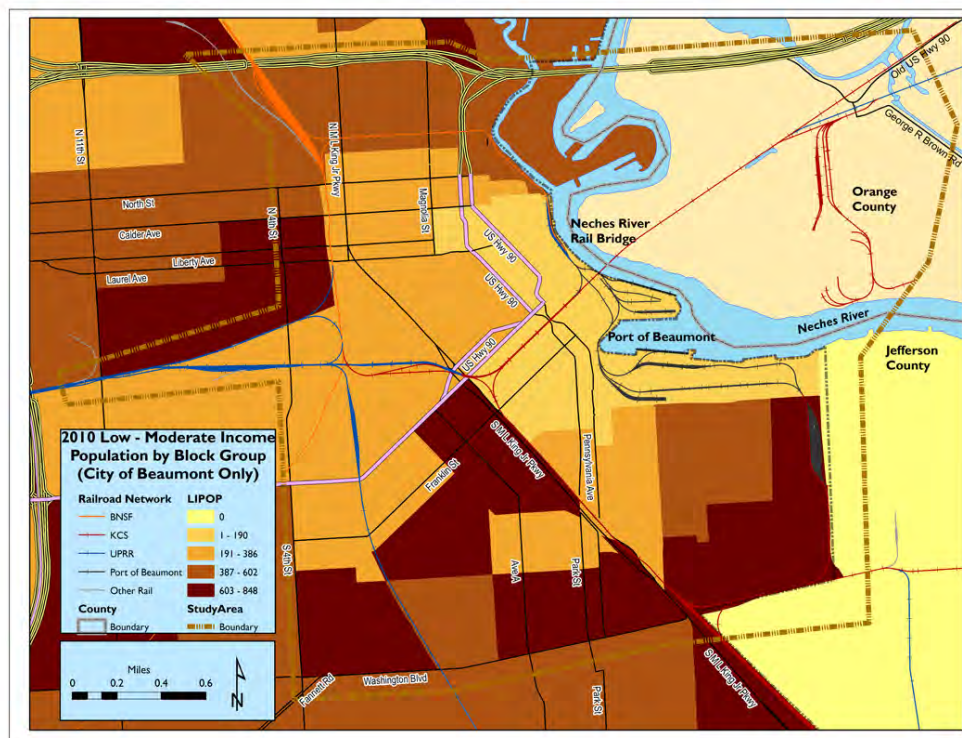
Income and race statistics are important to note for environmental justice reasons. Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation of environmental laws, regulations and policies. If a project utilizes federal funds and goes through the NEPA (National Environmental Policy Act) process, there is an obligation to avoid or minimize and mitigate adverse impacts to low-income and minority populations and to assure that disproportionately high and adverse impacts on these populations are identified and addressed.



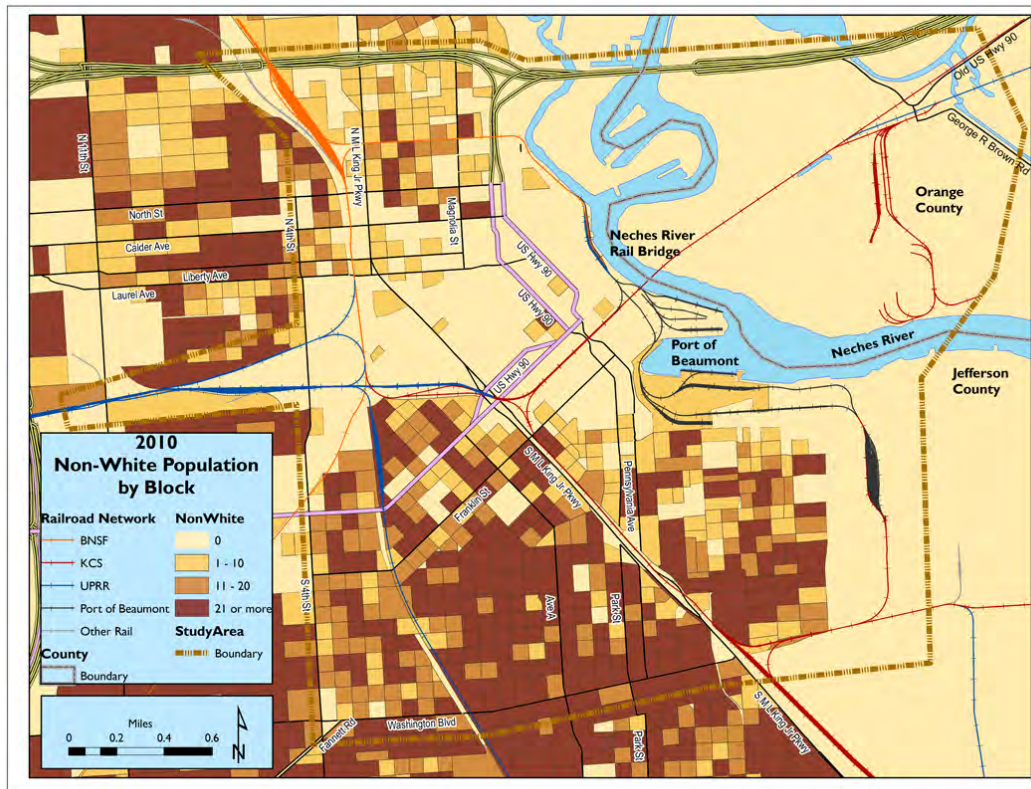
### Figure 2.1 - 2010 Households by Block



### Figure 2.2 - 2010 Low-Moderate Income Population by Block Group



**Figure 2.3 – 2010 Race: Percent Non-Caucasian By Block**



## Employment

Overall employment is expected to increase by 16.3 percent in the Jefferson-Orange-Hardin county region between 2002 and 2030. Since the 1970's, the regional job profile has been changing from "basic sector jobs" (i.e. mining, construction, manufacturing, transportation, communications, public utilities, and wholesale trade) to jobs classified as service (i.e. finance, insurance, real estate services, educational services, and governmental organizations) or retail. In 2002, "basic sector" employment for Jefferson, Orange, and Hardin counties accounted for 36.2 percent of employment in the region. By 2030, it is expected that these types of jobs will drop slightly to 34.1 percent of regional employment. By comparison, "service sector" employment accounted for 43.8 percent of regional employment in 2002 and is forecasted to grow slightly to 46.1 percent by 2030. Retail sector employment accounted for 19.9 percent of the overall employment in the region and is estimated to remain the same by 2030.

Major employers of over 1,000 employees within the City of Beaumont are show in Table 2.1. These employers account for 17.03 percent of all employment in Beaumont.

**Table 2.1  
Major Employers - City of Beaumont, Texas**

Number	Employer	Number of Employees
1	Beaumont Independent School District	2,893
2	Memorial Hermann Baptist Hospital	1,621
3	Christus St. Elizabeth Hospital	1,602
4	City of Beaumont	1,314
5	Lamar University	1,174
6	Jefferson County	1,093

Source: City of Beaumont 2011 Comprehensive Annual Financial Report

## **Water Resources**

The Neches River flows for 416 miles through east Texas to its mouth on Sabine Lake near the Port Arthur-Orange Bridge. The Lower Neches Valley Authority is the river authority which oversees the Neches River. Except for a few miles near its head, the Neches River for its entire length serves as a boundary stream, forming the county lines between Orange and Jefferson Counties. Two major reservoirs, Lake Palestine and Lake B. A. Steinhagen are located on the Neches. Several cities are located along the Neches River, including the City of Beaumont. From Lake B.A. Steinhagen down to Beaumont, the Neches River flows through the 97,000 acres Big Thicket National Preserve. This important ecosphere preserves the area where several ecosystems converge - an event that harkens back to the last glacial period. High rainfall rates produce frequent flooding of low-lying areas, and large floods occur on the average every five years. Floods in the basin are often of long duration.

During the late nineteenth and early twentieth centuries the upper Neches River basin was the site of intensive logging. Numerous sawmills were built along the banks of the river and its tributaries during this time. After 1901, the Neches River basin became the site of large-scale oil exploration. The growth of the oil industry led to the development of the Beaumont-Port Arthur-Orange metropolitan area as a major site for oil refining, processing, and shipping. As a consequence of these developments, the waters of the Neches River became polluted. Efforts have been made to clean up the stream. An area-wide water-quality management plan was adopted for the area. But in the early 1990's the pollution problem continued, especially in the river's lower reaches.<sup>16</sup>

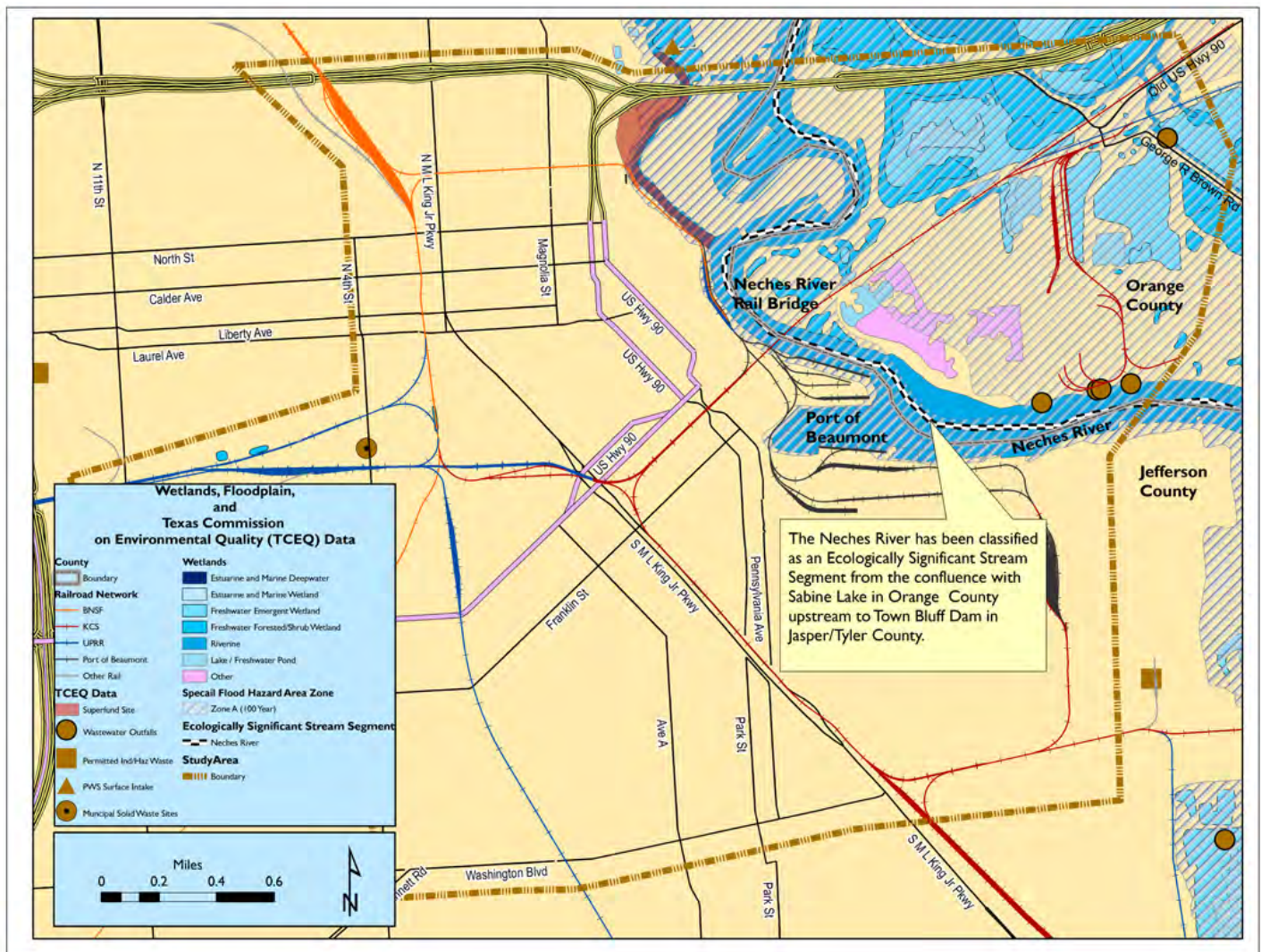
As a result of the passage of Texas Senate Bill 1 (SBI) in 1997, water planning in Texas became the domain of regional planning groups. As a part of the planning process, each regional planning group may include recommendations for the designation of ecologically unique river and stream segments in their adopted regional water plan. The Neches River from the confluence with Sabine Lake in Orange County upstream to Town Bluff Dam in Jasper/Tyler County (Texas Natural Resource Conservation Commission (TNRCC) classified stream segments 0601 and 0602) has been classified as an Ecologically Significant Stream Segment.



## Wetlands and Floodplains

Figure 2.4 displays the wetlands and floodplains in the study area. The Federal Emergency Management Agency (FEMA) designated Zone A floodplain covers a significant portion of the Orange County area within the study boundary.

**Figure 2.4 – Wetlands and Floodplains**



## Threatened and Endangered Species

The Neches River is part of the Great Texas Coastal Birding Trail. It also is considered to have a high water quality with exceptional aquatic life. Threatened or endangered (T&E) species and/or unique communities within the River include:

- Paddlefish
- Largest known population of sandbank pocketbook freshwater mussels in Texas; and

- One of the two largest populations of rare, endemic Texas heelsplitter freshwater mussels remaining.

Other T&E species within Jefferson County are listed in the Appendix. Since the study area has a large area of wetlands in Orange County, there is the potential for natural habitat for these species.

### **Archeological and Historic**

The Neches River basin has long been the site of human habitation. Archeological excavations have discovered evidence of all stages of southeastern Indian development, beginning with the 12,000-year-old Clovis culture. Indian development reached its peak after the arrival of the Caddos about A.D. 780.

There are two recorded historic structures as designated by the Texas Historical Commission (THC) in the study area as well as several more as shown in Figure 2.5 including the Mildred Building, 1929, built by Austin Company (1400 Calder Ave.) and Idle Hours Manor, 1903, built by Frank Tipton Smith (1608 Orange). The THC offers four types of designations to recognize and protect historic and prehistoric properties: National Register of Historic Places, Recorded Texas Historic Landmark, State Archeological Landmark, and Historic Texas Cemetery.<sup>17</sup> The City's website identifies several other locations as "historic" within the study area as well as a Historic District in the Downtown area.<sup>18</sup> However, the existing rail corridors do not abut any of these sites, though the Historic District includes the former Southern Pacific Depot.

### **Land Use Conditions**

Within Jefferson County, the major cities are Beaumont, Port Arthur, Port Neches, Nederland, and Groves. These cities generate most of the economic activity and house the majority of residents. Land uses in the central areas of these cities are predominantly industrial or commercial. Industrial activities include:

- oil refinery,
- oil and gas drilling,
- other types of petrochemical operations;
- port facilities and maritime shipping operations;
- marine construction and repair; and
- sulfur, salt, sand, and gravel mining.

Commercial land uses in the city center are mostly service oriented businesses and small retail shops. Areas on the periphery of these cities consist of residential and commercial districts as well as some agricultural areas. Residential areas are comprised of primarily low-density single-family residential units, while agricultural areas consist of cow pastures, ranches, and rice farms. Commercial districts consist of large shopping or strip malls with an assortment of stores, restaurants, and small strip malls. Institutional land uses are also prevalent. Community facilities within the study area are shown in Figure 2.6.



Figure 2.5 – Historic Resources

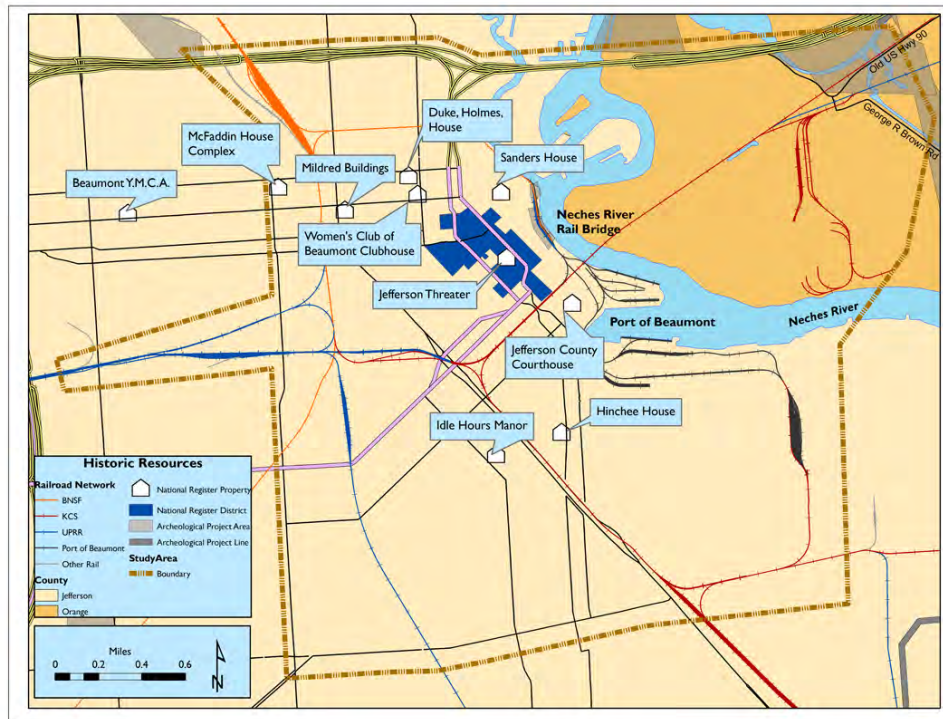


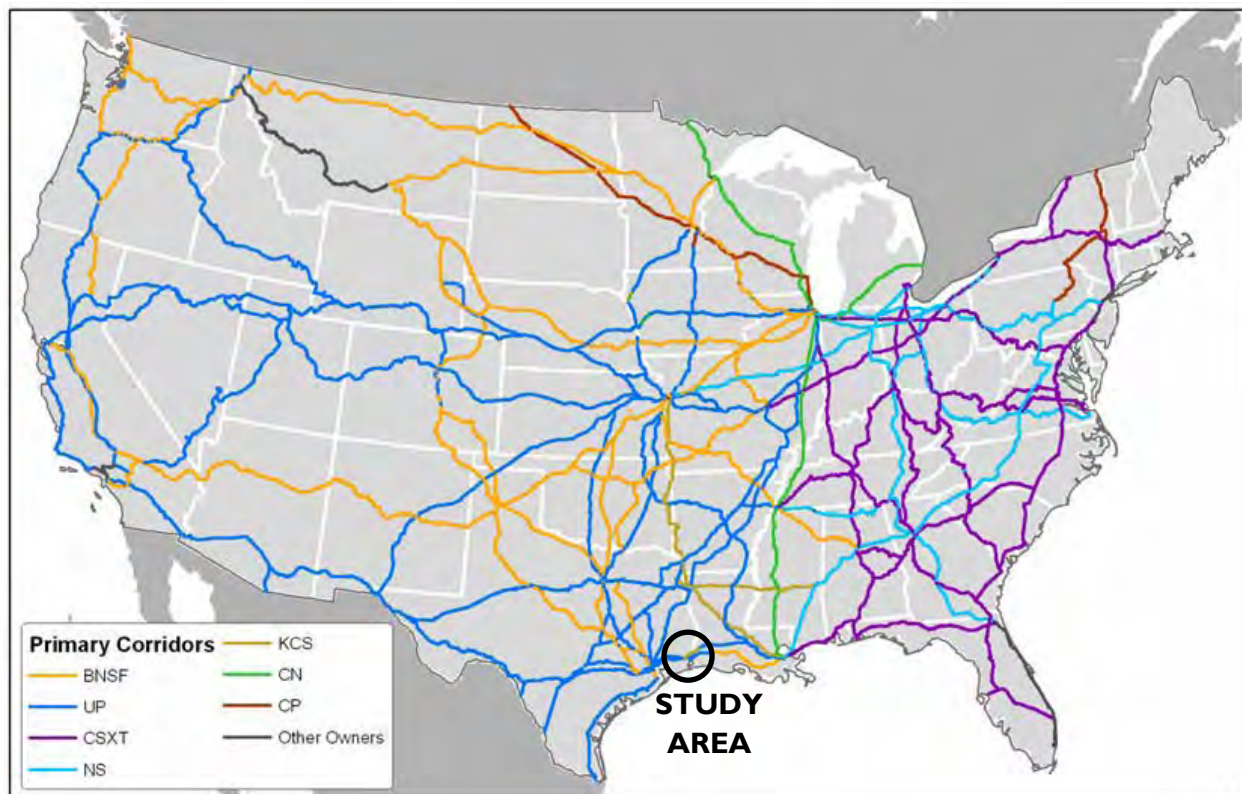
Figure 2.6 – Community Resources



## Inventory of Existing Rail System

This section discusses the rail systems of the three Class I railroads operating in the Beaumont area. It begins with a depiction of the freight rail carrier's national system and then moves into the regional system. In a similar manner, the passenger rail system is discussed. Elements of rail corridors are included with the identification of key at-grade crossing and service provide to local industries. Primary rail corridors throughout the contiguous United States are shown in Figure 2.7. These primary rail corridors are defined by a variety of measures such as volume of traffic, weight of traffic and value of traffic moved along the corridors. The Union Pacific Railroad section east of Houston through Beaumont, with the KCS bridge over the Neches River, is identified as a primary rail corridor.

**Figure 2.7 – Primary Rail Corridors – Contiguous United States**

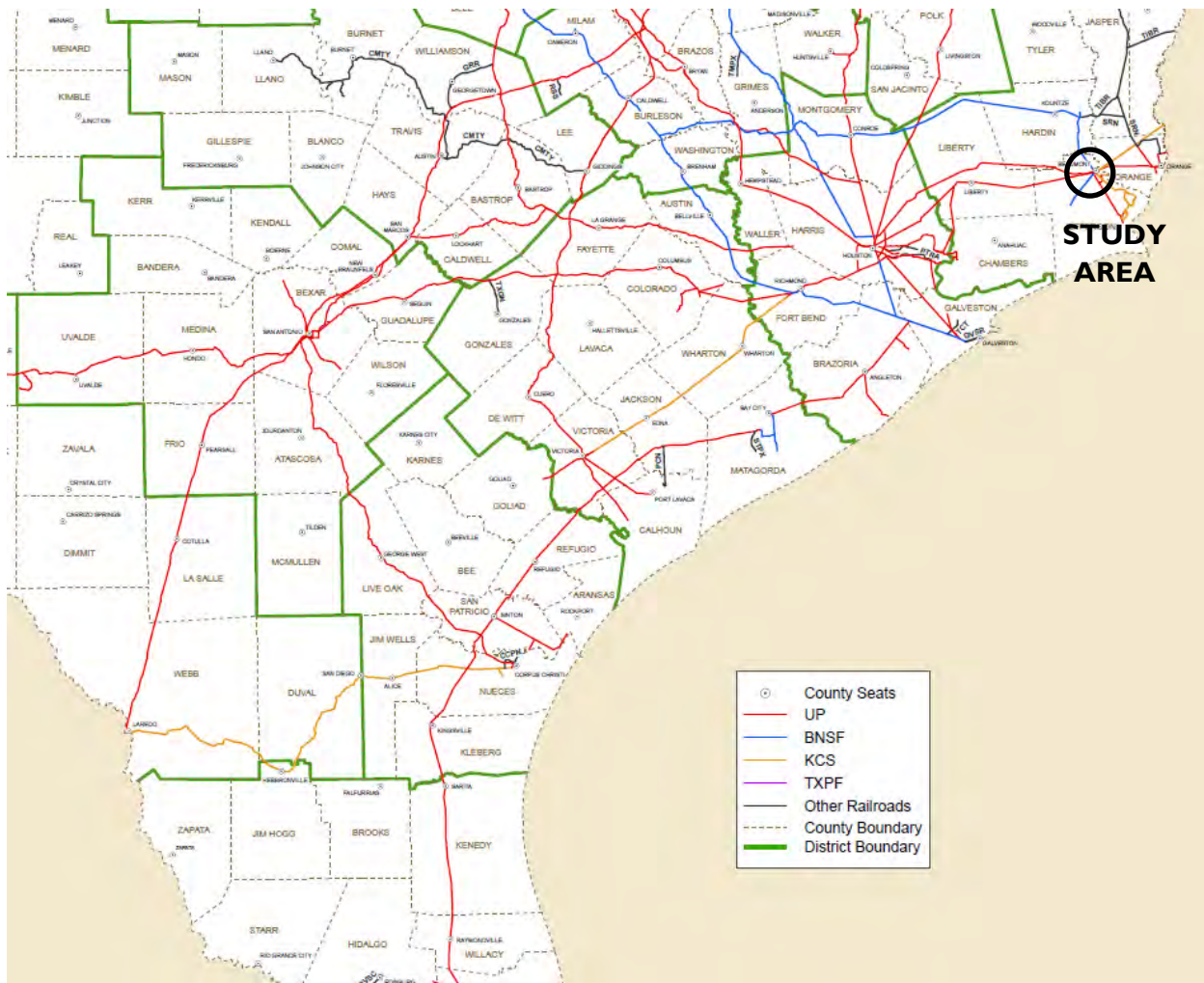


### Freight Railroads

Three Class I railroads utilize the Neches River bridge in the City of Beaumont, Texas. These railroads are the KCS that owns the bridge as well as the UPRR and the BNSF Railway which operate via trackage rights and in turn pay a fee to KCS. Figure 2.8 shows an overview of these railroads and others (including shortline railroads) in the southern portion of the State of Texas along the Gulf of Mexico from the border with Louisiana to Mexico.

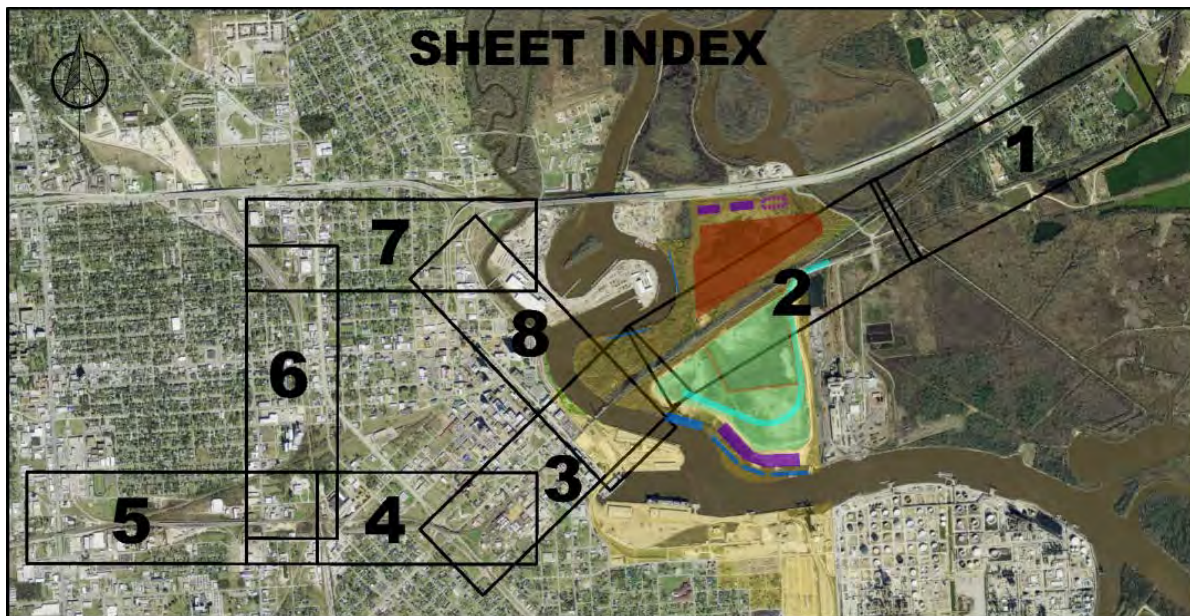


**Figure 2.8 – Rail Map of Southern Texas**



Each of the railroads is defined initially at a larger national perspective and then in a more regional perspective including the Beaumont region. Typically the descriptions follow the railroads milepost (MP) conventions which often increase when travelling westward. To assist in gaining an understanding of the location and context of the rail network, a series of maps is provided in the Appendix of existing conditions at 1" equals 200' scale with aerial photography. Figure 2.9 shows the limits of mapping and a sheet index for the study area beginning east of the KCS-UPRR split, west across the Neches River to a point on the Union Pacific line near IH-10. A loop is then made along BNSF tracks north to its Beaumont Yard and then to the Port of Beaumont at its junction with the KCS.

**Figure 2.9 –Sheet Index Map of Existing Conditions in Appendix**



### **Kansas City Southern (KCS) Railroad**

The Kansas City Southern Railroad is concentrated in the central Midwest and is an international railroad with service into Mexico as shown in Figure 2.10. Access to the Mexican market is through Houston, via DeQuincy, Louisiana and Beaumont, Texas.

For purposes of the Beaumont study area (and shown in the Appendix Exhibits I through 3), the KCS rail corridor begins at MP 763.4 and its stationing increases heading westward towards the Neches River. The rail corridor is a single track with varying right-of-way. There are two pertinent at-grade crossings of the KCS in Orange County; Rose City Drive (MP 763.79) and Old US 90 (MP 764.61). Near Rose City Drive, the right-of-way is 100 feet, while west of Old US 90 the right-of-way widens to 200 feet with the majority of available right-of-way on the north side of the track. At MP 764.87, there is a turn out to the UPRR track that goes to Orange, Texas and onward to Lake Charles, Louisiana.

The KCS track crosses the Neches River on a lift span bridge from Orange County to Jefferson County, Beaumont. On the west side of the bridge, the track has a diamond crossing to the Port of Beaumont before an equilateral turnout expands the line to double track to the wye approximately a mile to the west. At the wye, the KCS track turns south for more than 20 miles to reach Port Arthur. For nearly 1.25 miles, the KCS is physically separated from Martin Luther King (MLK) Parkway (TX 380) on an overpass structure. The Chaison Yard and service to numerous industries are on the line to Port Arthur. Chaison Yard has a capacity of approximately 420 railcars. The wye is commonly referred to as Gulf Coast Lines (GCL) junction or Station 13. The KCS rail corridor between Main Street and Trinity Street is identified on the track charts as having a 50 foot right-of-way on both sides of the centerline. Available property line information illustrates a total right-of-way width of 60-feet. There are three at-





KCS track also continues westward through the former Wall Street Yard to the KCS-UPRR interchange near Cedar Street. Three tracks are elevated over the junction of US-90 (the one-way couplet of College and Wall Street) and MLK Parkway (TX 380). There is one at-grade crossing with Crockett Street.

### **Union Pacific Railroad (UPRR)**

The Union Pacific Railroad has 31,900 route miles covering 23 states across the western two-thirds of the United States and is shown in Figure 2.11. The UPRR is headquartered in Omaha, Nebraska. The UPRR has an extensive presence in Texas with its major markets including Houston as well as several border crossings into Mexico. East of Houston, through Beaumont, the UPRR connects to New Orleans and its international markets.

**Figure 2.11 – Union Pacific Railroad National Map**



For purposes of the Beaumont study area, this rail corridor begins at MP 275.5 and its stationing increases heading westward towards the GCL Junction (approximate MP 278.0 and an equivalent station of MP 461.0). East of the UPRR/KCS Junction at Tower 31, east of the Neches River, the rail corridor is a single track within a 200 foot right-of-way. There is a public at-grade crossing of George Brown Road and then an assumed private crossing of an industrial siding which serves Gerdeau Ameristeel.

The UPRR double track continues westward from the joint KCS-UPRR double track at the GCL Junction crossing Crockett Street at-grade and then the railroad is grade separated over both 4<sup>th</sup> and 11<sup>th</sup> Streets. In between 4<sup>th</sup> and 11<sup>th</sup> Streets on the south side is UPRR's East Yard. UPRR's two main tracks continue westward for five miles to MP 456.0 near Dowlen Road before splitting to directional single tracks. Directional running, which in essence provides double track capacity, west of Beaumont utilizes the former Southern Pacific (SP) railroad for westward movements and the former Missouri Pacific (MP) Line for eastward movements.

Also in between 4<sup>th</sup> and 11<sup>th</sup> Streets north of the Municipal Waste Site at a diagonal is the former Southern Pacific alignment. UPRR now owns this track and utilizes it and several turnouts. The Amtrak station is located on the north side of these tracks immediately east of 11<sup>th</sup> Street. South of the UPRR-KCS Junction, another UPRR line continues to Port Arthur. UPRR's South Yard is located on this line between Crockett and Gilbert Streets. There are ten at-grade crossings along this rail corridor within the study area before Washington Boulevard. Two tracks cross US-90 which has over 30,000 vehicles per day at this location. A little more than two miles south of Washington Boulevard is a service track to the east to Exxon-Mobil's refinery. The UPRR owns several rail yards in Beaumont with a total capacity of approximately 1,700 cars.

With 24 percent of all freight cars handled by UPRR originating or terminating in Southern California, the Sunset Route is a key corridor for North American railroads. The Sunset Route is an important transcontinental route for package express business, finished automobiles, and grain. Less than one quarter of the Sunset Route had a second double-track when UPRR acquired it in 1996 as part of the merger with Southern Pacific. Since then UPRR has built 292 miles of new main line double-track through this corridor to handle the nation's growing freight traffic.

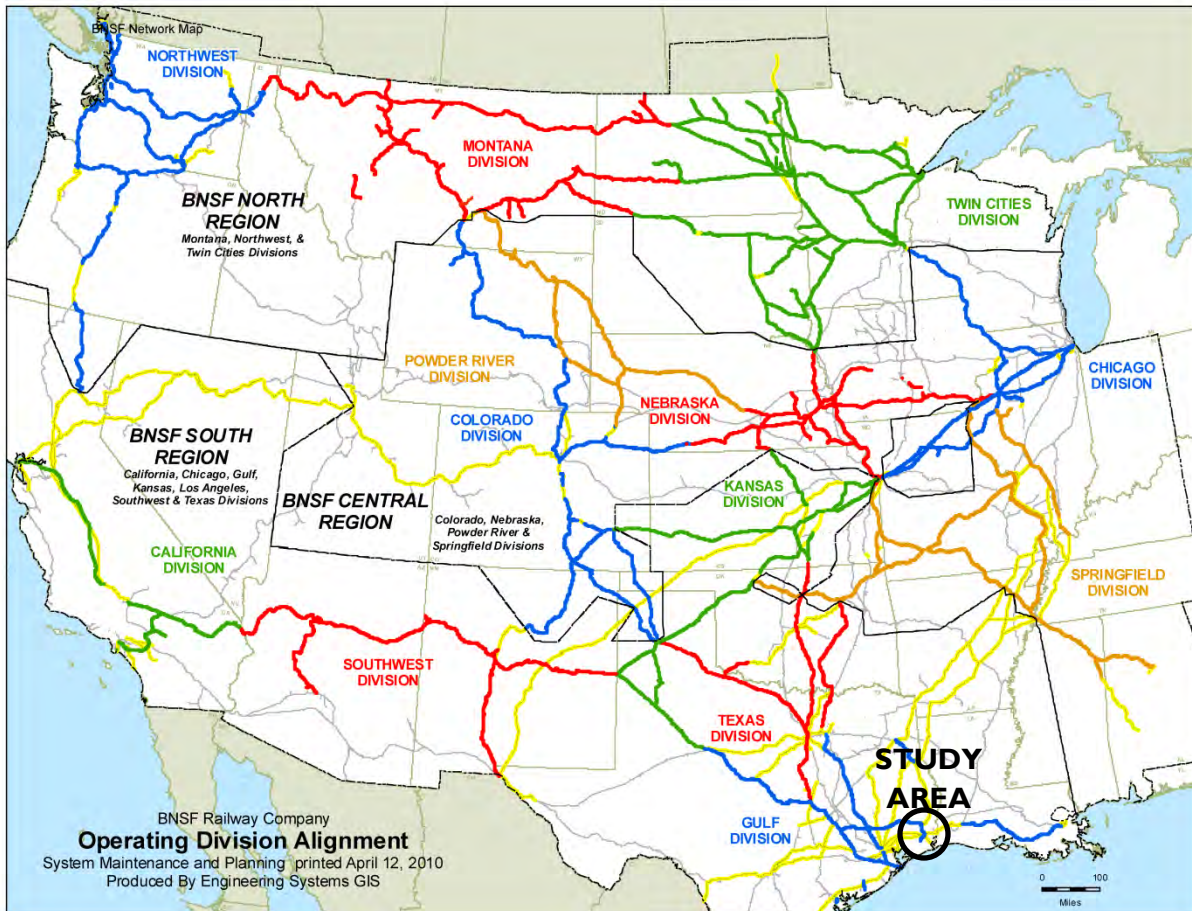
### **Burlington Northern and Santa Fe (BNSF)**

The BNSF Railway Company (BNSF), headquartered in Fort Worth, Texas operates one of the largest railroad networks in North America with 32,000 route miles covering the western two-thirds of the United States. Because of its extensive network in Texas alone, Figure 2.12 focuses in on BNSF's Gulf Operating Division. As BNSF does not have a hub in Houston, its presence through Beaumont is less prevalent than the other railroad companies.

For purposes of the Beaumont study area, the BNSF rail corridor begins at MP 0.0 (equivalent Union Pacific MP 30.0) and its stationing increases heading northward towards its yard, a portion of which passes beneath Interstate 10. The yard has a capacity of approximately 600 railcars. The rail corridor is a single track within an approximate 100 foot right-of-way with 1<sup>st</sup> Street parallel on the west side and Gulf Street parallel on the east side. There are six at-grade crossings south of the BNSF Yard. Between

Broadway and Calder Avenue, the horizontal alignment of the tracks shifts approximately 60 feet to the east.

**Figure 2.12 – Burlington Northern and Santa Fe (Gulf Operating Division)**



East of the BNSF Yard is a wye with a service track (Track 72) that is located in the middle of the Long Avenue right-of-way. The street right-of-way is approximately 60 feet wide and the road pavement is approximately 24 feet wide. The rail passes beneath US-90 before turning south along Pine Street and the west bank of Brake's Bayou. The BNSF recently upgraded the north connection along Long Avenue to the existing Port Interchange Yard which serves as their primary entrance accommodating nearly three-fourths of BNSF traffic. To access the Port of Beaumont, BNSF trains also use the diamond crossing immediately west of the Neches River Bridge. A former (now inactive) spur line crossed Brake's Bayou to Chicago Bridge and Iron. South and west of the UPRR-KCS interchange is the single track BNSF Subdivision to Fannett. Within the study area the BNSF has six at-grade crossings along the approximately 80-foot wide right-of-way.

### **Port of Beaumont**

The Port of Beaumont is accessible from the Gulf of Mexico and Intracoastal Waterway via the federally maintained Sabine-Neches Ship Channel, 42 miles upstream from the Gulf. It is the fourth busiest port



in the United States according to the American Association of Port Authorities. It is also the busiest military port in the U.S. and the headquarters of the U.S. Army's 842d Transportation Battalion, which specializes in port logistical activity. For purposes of the Beaumont study area, the rail serving the Port is focused upon the Port's Interchange Yard. Trains entering the Port of Beaumont are directed into the Port's Interchange Yard. The existing interchange yard for the port is located on the north side of the main line while the port is on the south side. The interchange yard, located along the Neches River, has six tracks. Five of the tracks are short storage tracks that have a total capacity of approximately 100 - 120 rail cars. The short length of these tracks requires the BNSF, UPRR, and KCS to split up inbound trains so that a single train can be made to fit. The lowline (lowest elevation track) from the interchange yard is below the high-water surface elevation and often stays wet. It has a 17'-6" clearance so it is used primarily for storage or movement of empty cars. The highline (highest elevation track) is used for loads traveling between the Interchange Yard and the Port. This track has a diamond crossing of the KCS track immediately west of the Neches River Bridge. Interchange yard tracks 3 and 4 currently prohibit the use of six-axle locomotives in favor of the four-axle locomotives used primarily for local traffic and yard work.

#### ***The Port of Beaumont's Master Plan***

This text focuses upon the Port's Orange county facilities which at this time appear to have begun development yet can be considered to be in the early stages of full build out. The Port's Master Plan presents an exhibit of potential facilities as shown in Figure 2.13. Major elements have been transposed onto the study's base-map to allow for an integrated planning effort. The Orange County port facilities can be divided into two basic areas that are physically separated by the KCS tracks. Under existing conditions, a crossing of the KCS tracks is not provided. Consequently the access to the two areas (north and south of the KCS) is described separately.

The site north of the KCS tracks is approximately a 215 acre area bounded on the north by the IH-10 eastbound frontage road, Old US-90 on the east side, the KCS tracks on the south side and the Neches River on the west side. Currently a large depressed area is in the center of the parcel. This depressed area is proposed as a 60 acre dredged disposal area. Along the nearly 2,200 foot of IH-10 frontage, a series of leased warehousing is proposed. A vehicular access drive is shown from Old US 90 heading westerly south of the dredge disposal area and then turning to cross the KCS tracks into the south parcel of the Port. Along the Neches River frontage, two container-on-barge wharf facilities are proposed. Water access to and from these wharfs will require a lift at the KCS bridge. No rail service is currently provided nor is shown as proposed to this parcel north of the KCS tracks.

The site south of the KCS tracks is approximately a 250 acre area bounded on the north by the KCS tracks, the rail tracks of the Gerdeau Ameristeel facility on the east side, and the Neches River on the south and west side. Currently vehicular access is provided from George R. Brown Drive which leads into Gerdeau Ameristeel and has an at-grade crossing of the UPRR tracks. Rail service to the property is an extension of the service tracks to the steel facility. The rail service would follow the eastern property line and reach a dock on the Neches River. Other tracks would swing up into the site to access an open storage area. Several general cargo docks are shown along the Neches River that could serve up to five ships.

Figure 2.13 – Port of Beaumont Master Plan (Orange County)

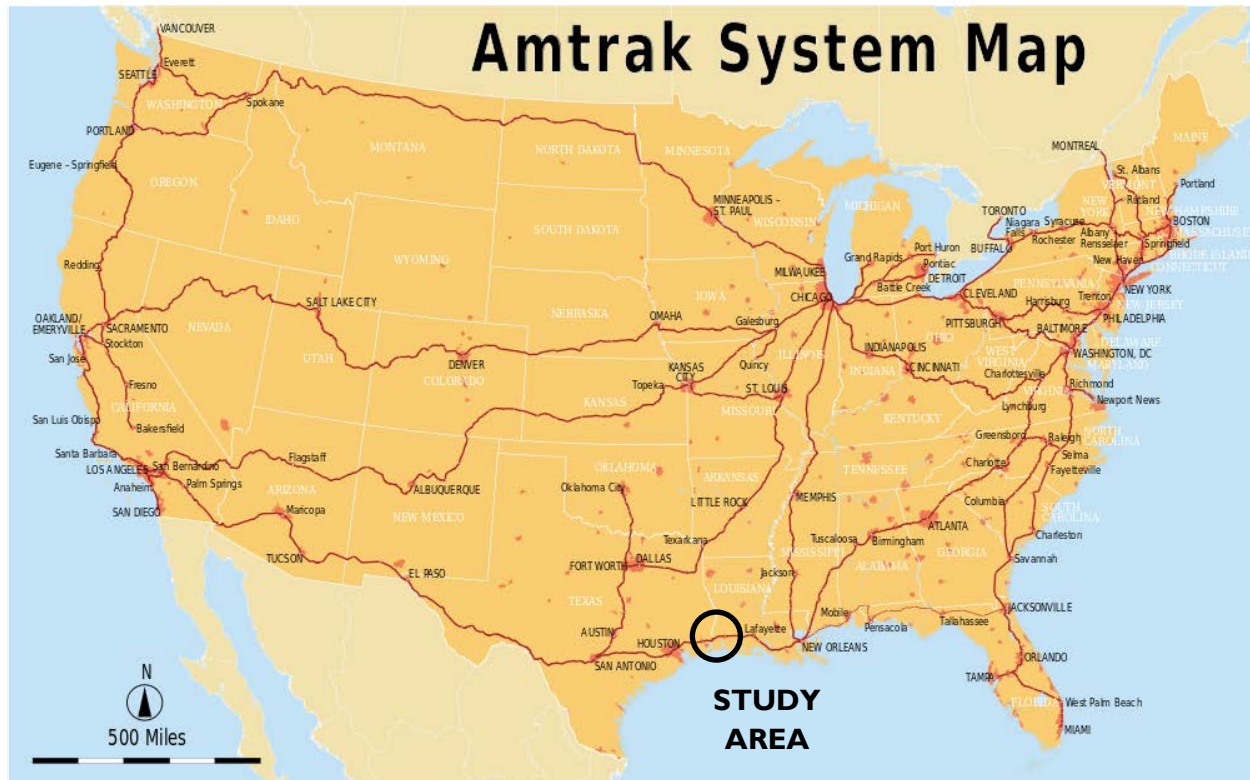


### Amtrak

Amtrak provides intercity passenger rail service in Texas via the Sunset Limited, Heartland Flyer, and the Texas Eagle which serve most of the State's major urban areas, as shown in Figure 2.14. The Sunset Limited as shown in Figure 2.15 provides service to the City of Beaumont. The Sunset Limited's current schedule runs three times a week in each direction. Westbound trips stop in Beaumont on Mondays, Wednesdays, and Fridays while eastbound trips stop on Tuesdays, Fridays, and Sundays. Ridership at the station in Fiscal Year (FY) 2010 was 2,135 or approximately 40 passengers per week.

The Amtrak station is located at 2555 West Cedar Street. Facilities include a small unattended parking lot and 650 foot long platform. Recent improvements were made at the station for passengers requiring wheelchairs as well as adding lighting, a small passenger shelter, and other site improvements.

**Figure 2.14 – Amtrak Passenger Rail Lines National**



**Figure 2.15 – Amtrak Sunset Limited Route**



## Rail Corridors

This section on rail infrastructure focuses upon the primary east-west corridors within the Study Area. Additional rail service is provided in a north-south direction via several spur lines. An understanding of train traffic volumes in the next section confirms this perspective of primary east-west movement. While many of the rail corridors are under one principal owner, trackage rights along the corridors allow other railroad carriers under an operating agreement to utilize the rail corridors.



The primary east-west rail corridor through the Beaumont area is maintained by the KCS and UPRR to the appropriate Federal Railroad Administration (FRA) classification based on the posted speeds. A review of the Beaumont Time Schedule, dated September 1, 2010 indicates the following posted speeds:

- 50 mph (miles per hour) on the KCS tracks east of the KCS/UPRR split (single track),
- 50 mph on the UPRR tracks east of the KCS/UPRR split (single track),
- 40 mph on the KCS tracks east of the Neches River bridge to the KCS/UPRR split (single track),
- 20 mph from the Gulf Coast Line (GCL) wye on the KCS tracks (double track to Main Street) through the Neches River bridge (single track),

The Neches River rail bridge is a vertical lift span bridge that allows river traffic to pass under the bridge. River traffic appears equally split between industrial barges and pleasure craft. The Beaumont Yacht Club immediately north of IH-10 has four launch ramps and several covered and uncovered slips. The bridge is in the rail-locked position until a navigation request is made to raise the lift bridge, generally to a requested vertical clearance. Information supplied by the United States Coast Guard (USCG) indicates approximately 400 lifts per year.<sup>19</sup> The bridge is controlled from the KCS Kansas City, Missouri dispatch office. Data from KCS indicates 7 lifts in a six day period (Monday, September 12 through Saturday, September 17, 2011) which is consistent with the USCG's annual lifts.

The railroad lift bridge across the Neches River is located at navigation mile 19.5. It has a maritime horizontal clearance of 200 feet, a vertical clearance of 13 feet above mean low water in the closed position, and a vertical clearance of 150 feet above mean low water in the open position. Note that the stated vertical clearance on the National Oceanic and Aeronautical Association (NOAA) charts is 145 feet. These clearances have been adequate to date, as the USCG has not received any complaints from waterway users.<sup>7</sup> From a railroad perspective, the bridge's truss structure can accommodate double stack train cars. While train speeds are limited to 20 mph, this is in part associated with the track geometry immediately west of the bridge. Because of the track and bridge conditions, capital investment improvements are currently planned including the replacement of the west timber approach and cables and sheaves on the lift bridge.

In the case of westward trains, trains are held at the KCS/UPRR split at Tower 31 in order to avoid blocking road crossings. Thus the KCS dispatcher cannot send a train across the river bridge until the UPRR dispatcher releases a signal in their territory in order to prevent trains from stopping on the bridge

### **Key At-Grade Crossings**

Nearly 100 highway/rail at-grade crossings (active, inactive and former crossings) were initially identified within the study area. After a field reconnaissance, review of roadway functional classifications and vehicular traffic volumes at the railroad crossings, the list of active key highway/rail at-grade crossings of public streets was reduced to ten (10). These ten crossings were viewed as representative of key rail corridors (for both existing conditions and potential future alternative corridors) at the crossings of important community roadways. For reference purposes, additional active at-grade crossings as well as grade separated crossings are shown with the key at-grade crossings selected in Figure 2.16. This data

establishes the existing conditions for the at-grade crossings. The key crossings were evaluated within a series of corridors using "GradeDec.net" which is a decision support tool developed by the Federal Railroad Administration (FRA) for benefit-cost analyses of investments involving highway-rail grade crossing improvements.

The key at-grade crossings are located at collector and arterial streets within Beaumont and at two locations in Orange County. It is anticipated that these crossings could be impacted by growth in either train or vehicular volumes or both, as well as changes to train volumes based upon potential new alignments. The highest vehicular traffic volumes are along US 90 at the BNSF Gulf Silsbee crossing and the UPRR Lafayette crossing. The BNSF Port of Beaumont line also crosses Martin Luther King (MLK) Parkway with an average daily traffic (ADT) volume of 27,000. While these crossings were identified as key locations, the majority are currently equipped with gates and flashers. The next level of improvement would be a grade separation between the rail and roadway.

**Figure 2.16 – Key At-Grade Crossing Locations**

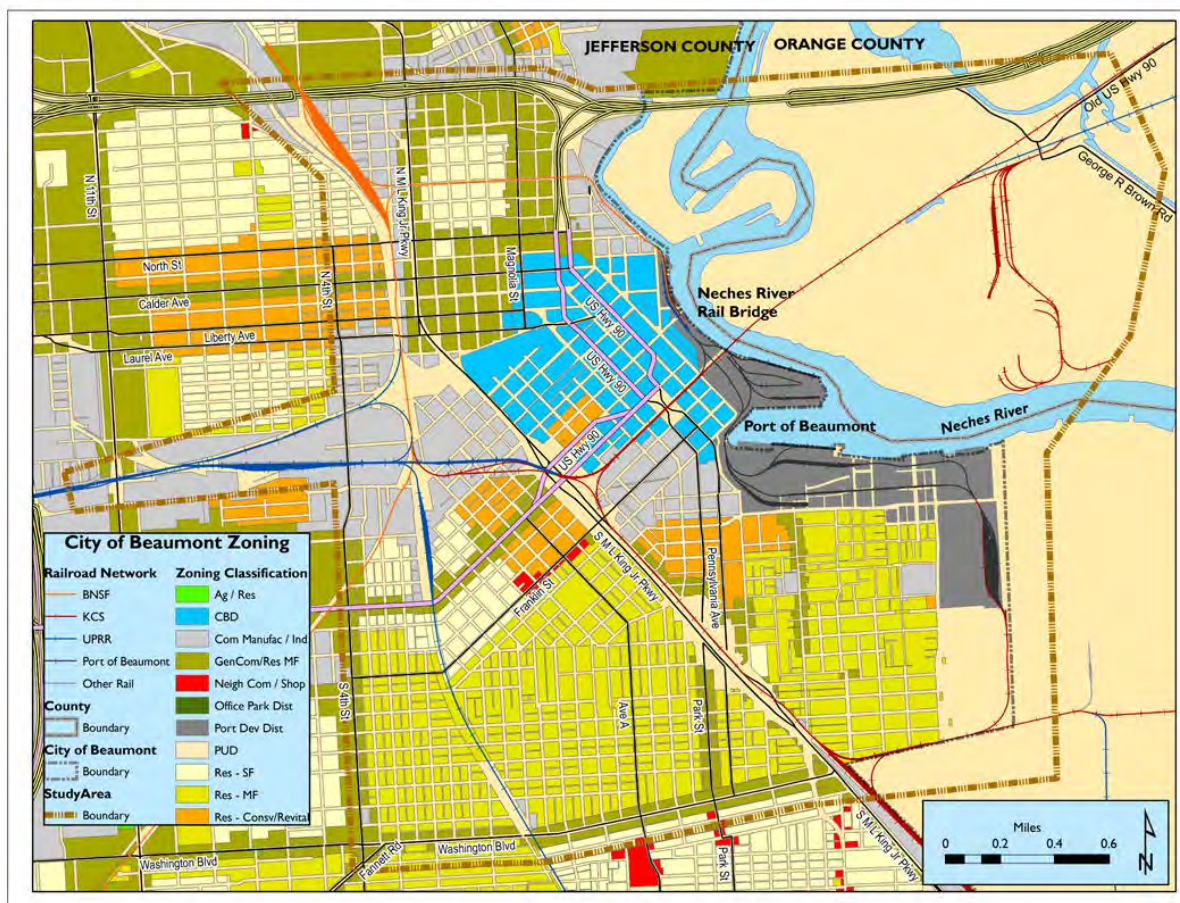




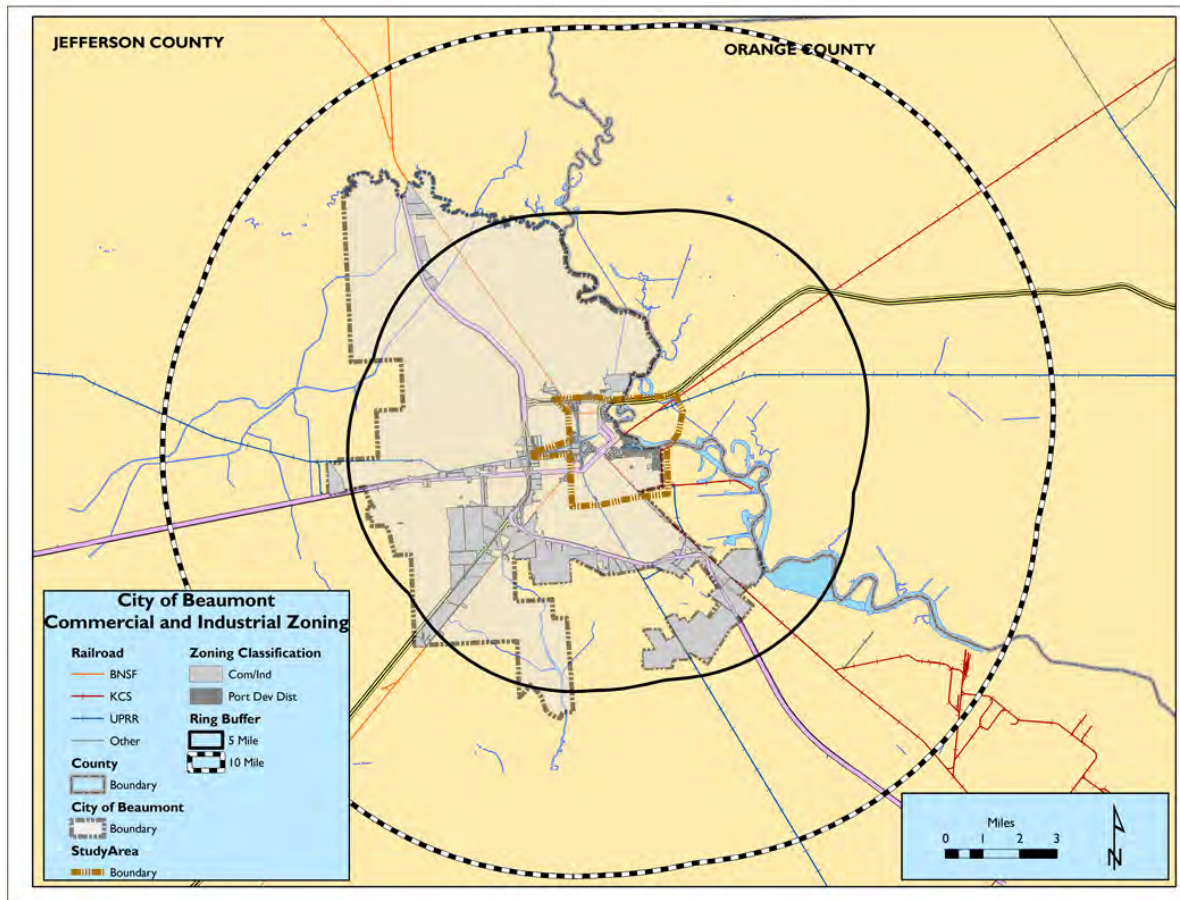
### Local Industries Served

Many local industrial and distribution companies are served by rail. As a city and region served by railroads for over 100 years, numerous industries have developed adjacent to the rail corridors over decades. In fact much of the local and regional industrial land uses are located near the rail corridors as shown in Figures 2.17 and 2.18. While some industry spur lines have been removed, many others remain active. The industries are located within the central downtown area of Beaumont as well as along the City's edges, including immediately west of the Beaumont Airport. The KCS recently assisted in the development of the 400-acre Triangle Marine Industrial Park. The industrial park has access to a 23-acre rail yard and includes a switching yard with a 150-car capacity, which could potentially be expanded to 300 cars. The site has 1,700 feet of frontage on the Neches River with 3 deep water docks and a 90-acre turning basin.<sup>20</sup>

**Figure 2.17 – Land Use within Study Area**



**Figure 2.18 – Industrial Land Use in Beaumont Region**



There is a neck of land located between Brake's Bayou and the Neches River as well as between the IH-10 and the KCS bridges that formerly had rail service. While within Jefferson County, the area is outside the City of Beaumont. Since the early 1900's, the land was used for shipbuilding. During World War II, its two side-launch ways were increased to four. In 2006, Trinity Industries sold it to Chicago Bridge & Iron (CBI) for use as a fabrication base for CBI's contracts to construct Liquefied Natural Gas (LNG) import terminals. Trinity Industries has moved some five miles to the east near Vidor with service from the UPRR line.

## Current Railroad Operations

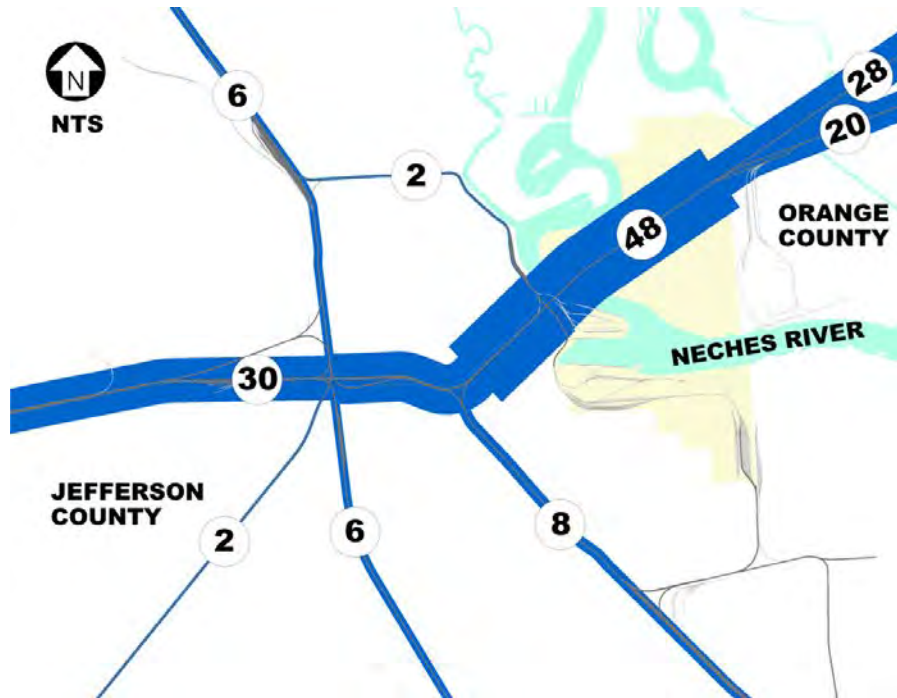
This section provides an overview of train operations in and around the Beaumont region that could directly affect operations within the Study Area. First existing traffic volumes are discussed then the operations at various yards. Also discussed is the topic of crew changes on the KCS and UPRR railroads.



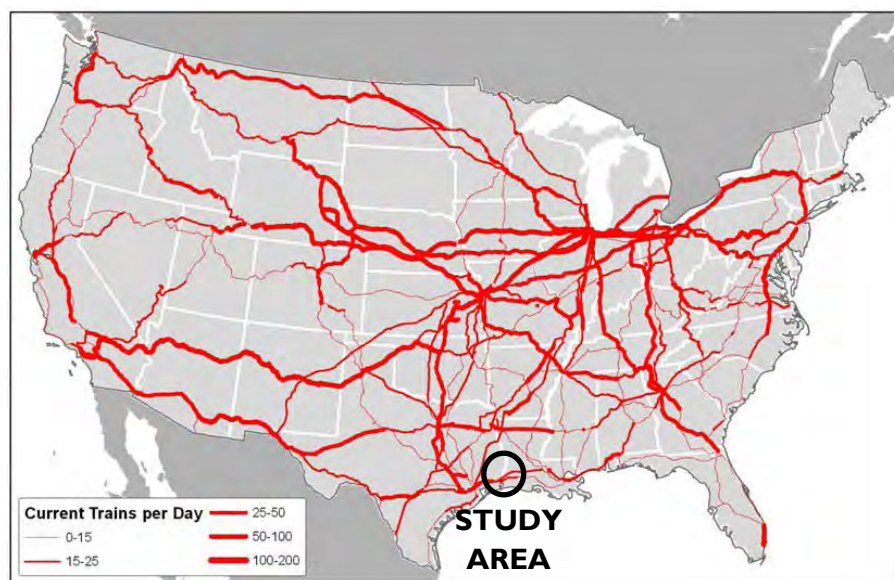
### Existing Rail Traffic Volumes

The daily train count across the Neches River bridge ranges between 40 to 50 trains based upon the most currently available information in the FRA's database of crossing. Figure 2.19 represents that information as a band of varying thickness similar to the national figure shown in Figure 2.20.

**Figure 2.19 – Daily Train Volumes Beaumont Area (FRA database)**



**Figure 2.20 – Daily Train Volumes - National**

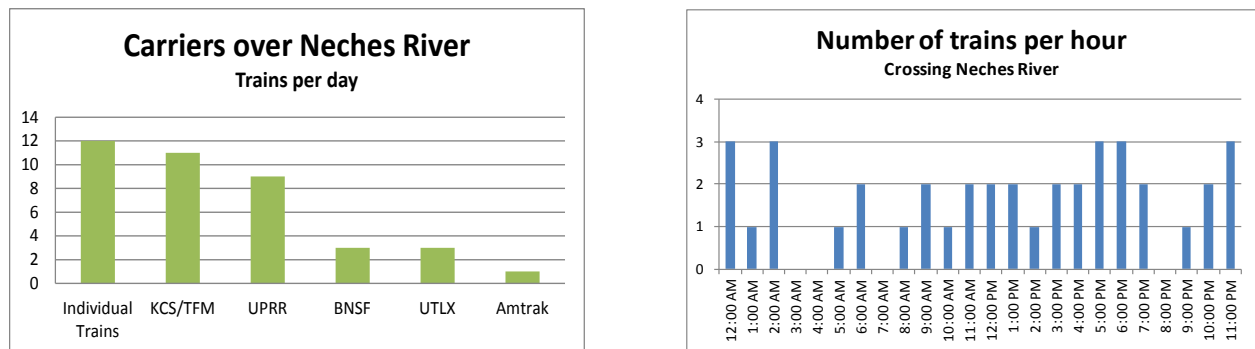


A daily breakdown of trains crossing the Neches River bridge was received from the KCS railroad. A review of this spot location shows:

- A total of 39 trains in a day cross the Neches River bridge, including one Amtrak train
- The average speed across the bridge ranged from 11 to 21 mph (average speed of 14.8 mph),
- The length of trains ranged from 7 to 118 cars, averaging over 60 cars per train, and
- The maximum number of trains that crossed in an hour was three (3), which occurred five times throughout the day.

A range of distribution by carriers occurred as shown in Figure 2.21. Individual trains include CSXT, DTTX, GMTX, IBT, MDW, NAHX, SRN, TILX, TPIX, TR, TTGX, and XOMX.

**Figure 2.21 – Sample of Neches River Rail Crossings**



While requests for bridge openings can occur at any time, most occur during daylight hours. Each request to raise the bridge includes a clearance (in feet) which allows the bridge to open only as high as necessary to accommodate river traffic. Data provided by KCS over a random six day period indicates:

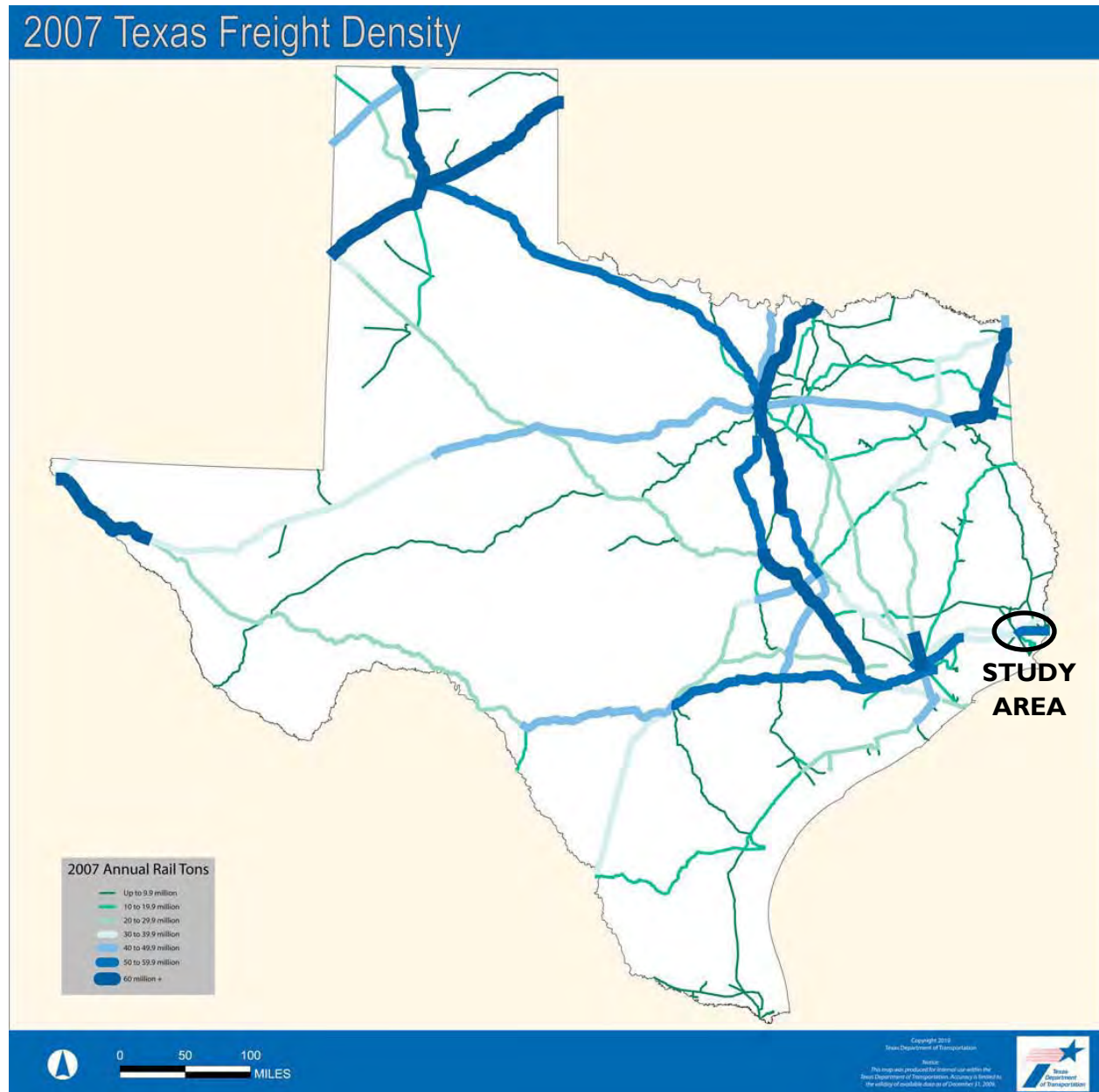
- Requests for seven (7) lifts, for four northbound and three southbound marine vessels,
- The requests occurred on Monday, Wednesday Thursday and Saturday,
- Two boats on a Saturday were identified as pleasure craft, and
- The requested clearance ranged from 30 feet to 70 feet.

The raising of the bridge can result in some train delays, especially for trains going in the same direction across the bridge as they must be separated by two signals in order to prevent a train from stopping on the bridge. Trains traveling in opposite directions do not have to be separated by two signals. Typically the bridge stays open to river traffic between 15 and 30 minutes. However it may be open longer due to river traffic not appearing at the time requested or mechanical issues with the bridge. Mechanical issues often occur with high temperatures as experienced in the summer of 2011.

Additional national, state and regional data illustrate similar patterns of usage based upon tonnage. For example Figures 22 and 23 illustrate 2007 annual rail tons across the state of Texas and in more detail the Texas East Region. Typically any rail corridor with 30 or more million gross tons (MGT) is considered a critical rail corridor because it represents a significant level of business to the rail carrier.

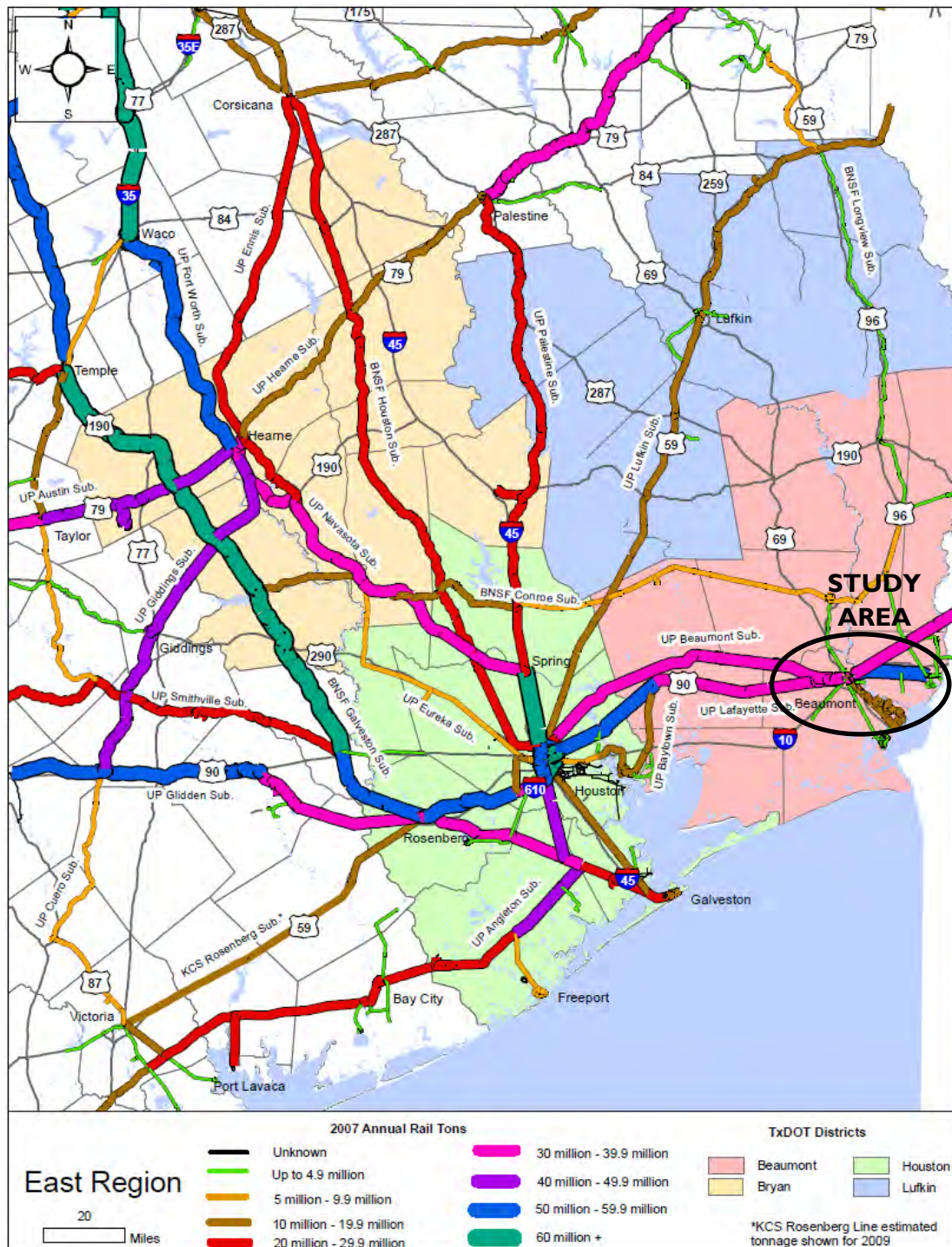
It is also worth noting that with UPRR's directional running of traffic west of Beaumont and with the KCS-UPRR split east of Beaumont, the tonnage through Beaumont is far in excess of 30 MGT.

**Figure 2.22 – Freight Density - Annual Rail Tonnage - Texas**



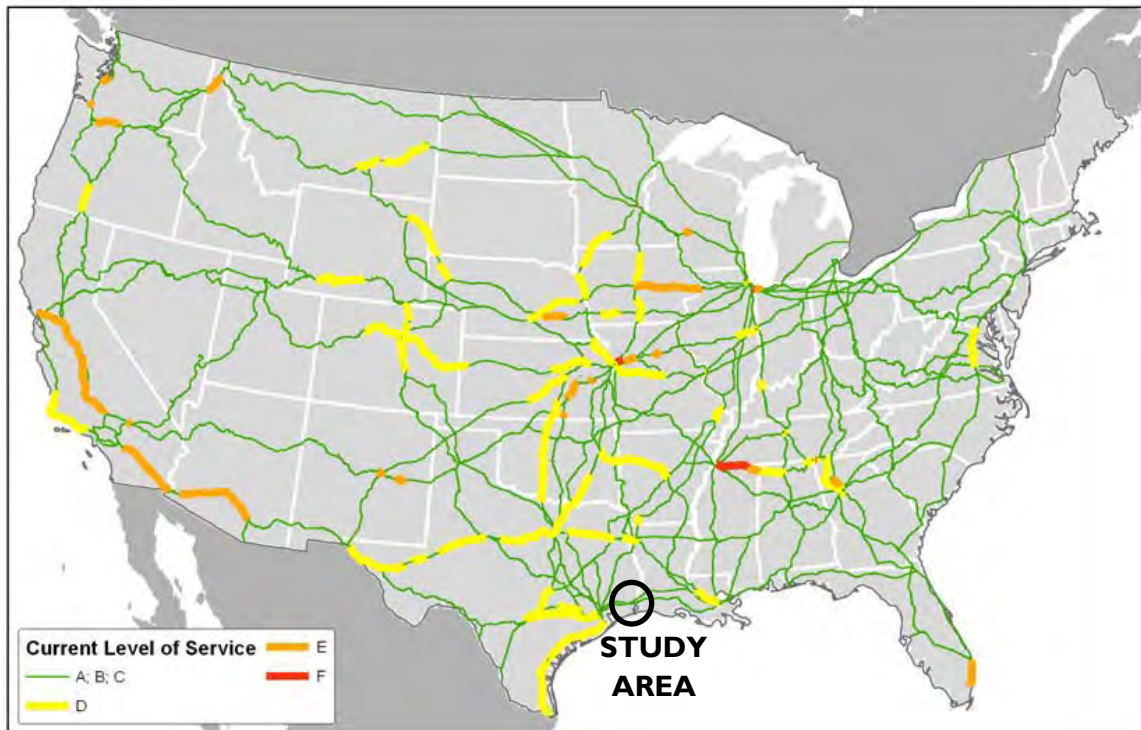


**Figure 2.23 – Freight Density - Annual Rail Tonnage – Texas East Region**



An overview of national railroad operations in terms of Level of Service is shown in Figure 2.24. The importance of this perspective will be more apparent when reviewing projected conditions in the next section of the report.

**Figure 2.24 – Current Level of Service - National**



### **Yards and Crew Changes**

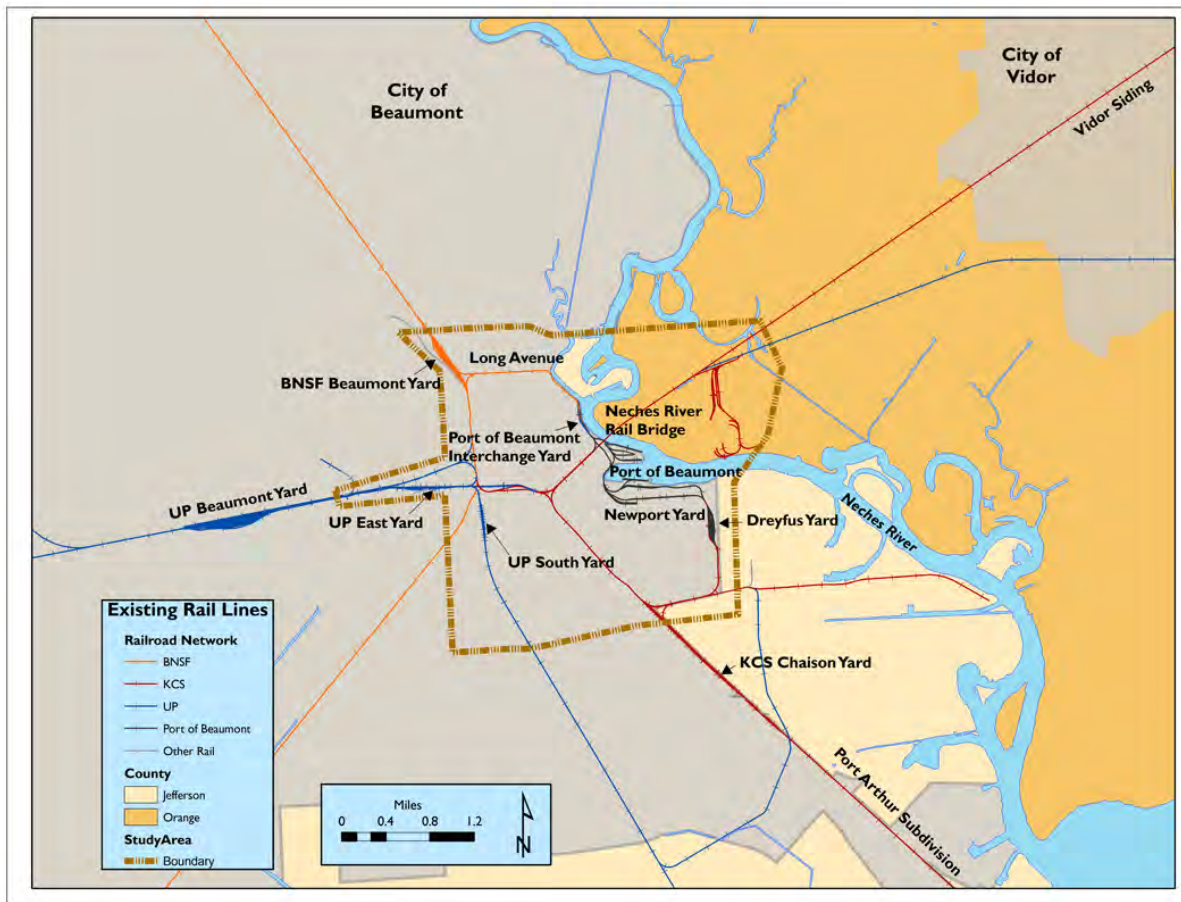
Yard capacity and efficiency has a direct influence on the operations of the rail system. Several yards are located in and around the Beaumont area as shown in Figure 2.25 and include:

- Port of Beaumont Interchange Yard
- KCS's Chaisson Yard and Vidor Siding
- UPRR's South, East and Beaumont Yards
- BNSF's Beaumont Yard.

Each is described in more detail along with crew changes when and if applicable. Another important issue regarding train traffic through Beaumont is that close follow-up movements are restricted by crew changes in each direction. Both the UPRR and KCS have crew changes in Beaumont which occur on the railroads main lines.



**Figure 2.25 – Rail Yards in Beaumont Region**



### **Port of Beaumont Interchange Yard**

While the Port of Beaumont has several internal yards within the Port's boundaries and south of the Neches River bridge including Newport Yard and Dreyfus Yard, the Interchange Yard north of the Neches River bridge has been the subject of numerous operational issues. The Ports' yards are shown in Figures 2.26a through c. When a train is currently being delivered to the Port of Beaumont, the train operator must approach the Port turnout from the west and then "run around" the cars and then shove them into the interchange yard, which briefly blocks both main tracks at the diamond. Trains coming from the east pull past the turnout and reverse into the yard. Any train cars moved from the Interchange Yard to the Port also blocks the mainline. The low line, with its limited vertical clearance, is only used for moving train cars from the Port to the Interchange Yard. In either case; one of the two main tracks is blocked for an extended period, effectively lengthening the single-track portion of the route.<sup>21</sup> Rail cars are handled within the Port's perimeter by Trans-Global Solutions, Inc., a contract switching operator. Moving cargo into and out of the port is assisted by an extensive railway system that can accommodate 600 rail cars and handles 80 cars simultaneously at shipside.<sup>22</sup>

Figure 2.26a – Port of Beaumont Interchange Yard

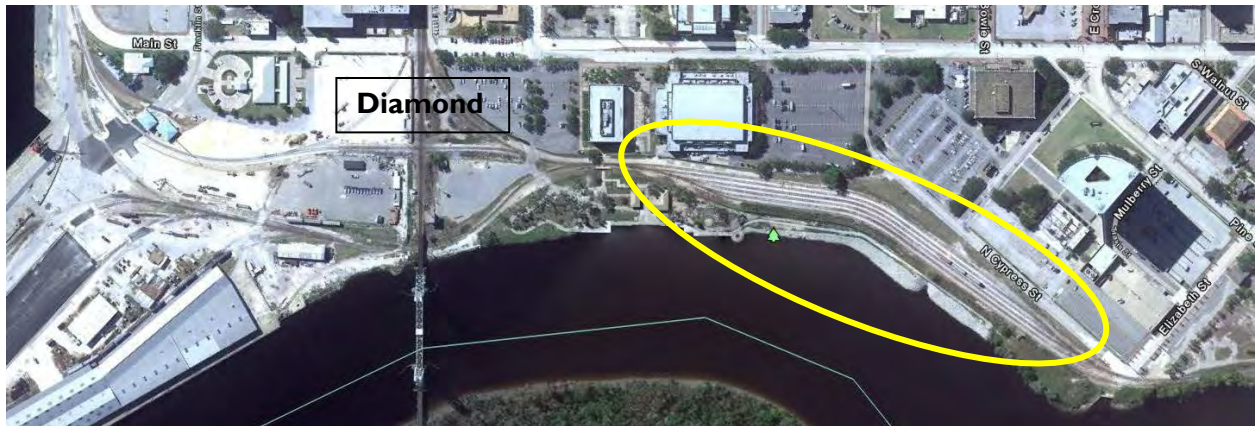


Figure 2.26b – Port of Beaumont Newport Yard



Figure 2.26c – Port of Beaumont Dreyfus Yard





BNSF utilizes the Long Avenue connection as their primary entrance to the Port. The UPRR has trackage rights along Long Avenue and occasionally utilizes it to exit the Interchange Yard after delivering rail cars. Under this scenario the UPRR will pull off the KCS main track, then take headroom toward the BNSF heading out the north end of the Interchange Yard and place their rail cars into the interchange yard without blocking the KCS mainline.

In 2003, the Port of Beaumont contacted TxDOT to discuss a proposed plan that would improve the rail infrastructure at the Port with the purpose of reducing rail traffic delays. The Port proposed construction of a new turnout from the KCS mainline, south, directly into the Port and adding capacity in the Port by extending current tracks and constructing new tracks. This would enable the railroads to perform interchange services within the Port itself, making the north yard unnecessary. TxDOT studied the proposal and found it to be both feasible and beneficial. The Beaumont MPO provided \$8.5 million in Congestion Mitigation and Air Quality (CMAQ) funds for the project. It is currently under construction. The current intent, once the project is completed, is that one running track will remain through the former yard to allow BNSF access to and from the Port. All other tracks would then be removed.<sup>23</sup>

The Port of Beaumont handled almost 48,000 rail cars in 2003. Of these rail cars 26,398 (55 percent) were moved by the BNSF; 19,138 (40 percent) were moved by the UPRR; and 2,344 (5 percent) were moved by the KCS.<sup>24</sup> This amount of annual traffic is equivalent to 925 rail cars per week on average. The Port moves four main commodities: grain, potash, military equipment and wind turbine equipment. According to the American Association of Port Authorities, the Port of Beaumont ranked 54th in the world in 2009 based upon total cargo volume.<sup>15</sup> This ranks the Port of Beaumont 7<sup>th</sup> in the United States with 67.7 million tons. The Port of Beaumont's expansion and the new rail access route from the KCS main tracks will likely increase rail volumes in and out of the Port. The new route will enable other development on the vacated property. However, BNSF cross traffic will continue to operate through this location.<sup>16</sup> Expansion by the Port to property located on the east side of the Neches River with a planned rail facility may also increase rail traffic across the bridge due to internal movements within the Port. Slow moving unit trains and other rail traffic entering and exiting the Port on both sides of the Neches River may influence the need for capacity improvements as well as to allow through traffic to bypass port switching movements.

#### ***KCS's Chaison Yard and Vidor Siding***

The KCS has its yard located on the line to Port Arthur, TX. In addition, the KCS utilizes the Vidor Siding as a critical operational element for staging trains as well as for conducting crew changes. Consequently, both are discussed here and are shown in Figures 2.27a and b.

**Figure 2.27a – KCS Chaison Yard**



Chaison Yard is located southwest of the Neches River bridge and is bordered by the Port of Beaumont to the east and MLK Parkway (TX Route 380) to the west. Six tracks are used for train makeup and arrival. Storage cars are held here for Exxon Mobil and other customers. UPRR unit trains carrying soda ash and other commodities pass through Chaison Yard enroute to Port Arthur. Local trains to the south and the east depart and arrive through Chaison Yard. The connector track (nearly two miles in length) from Chaison Yard to the UPRR is used for KCS-UPRR interchanges, KCS-BNSF interchanges, and KCS Acid Unit Trains for the Port Arthur Subdivision. The main track from GCL Junction to Chaison Yard is used by a daily local each way and a daily manifest train each way. In addition, yard jobs make transfer runs to the BNSF, UPRR, Port of Beaumont, and other area industries such as Gerdeau Ameristeel in Orange County on Tuesdays and Thursdays. This occupies the single main track (with no passing) west of the KCS-UPRR split at Tower 31 for approximately to two hours. KCS Chaison Yard to the south originates and terminates some of these trains as well. Rail traffic on the KCS Port Arthur line is also expected to grow through new contracts signed for several commodities involving unit train operations.

**Figure 2.27b – KCS Vidor Siding**



Vidor siding is located at KCS MP 760.4 on the Beaumont Subdivision. It is approximately five miles east of the Neches River bridge. This siding is 13,424 feet in length which enables it to serve as train storage and a staging location for KCS trains, many enroute to the U. S. – Mexican Border at Laredo, TX. Because of the length of this siding, often two trains can be stored at the same time. Vidor siding is also the designated crew change point for westbound freight trains operating between Shreveport and Houston. The siding is under Centralized Traffic Control (CTC) for the meeting and passing of trains. This is the first siding location for the KCS east of Rosenberg, TX. KCS trains are staged at Vidor siding for movement beyond Houston on the Rosenberg Subdivision as well as the UPRR Brownsville Subdivision. The KCS dispatcher cannot line westward trains by Vidor until given permission by the UPRR dispatcher for routing instructions and clearance of main tracks through UPRR's Beaumont Yard.

The KCS eastbound trains change crews at Pearl Street immediately west of the Neches River bridge, while westbound trains change crews at Vidor siding. Crew changes normally take 15 – 30 minutes. Crews are driven to either location from Chaison Yard. KCS westbound trains experience delays at Vidor siding due to operating window restrictions in place by the UPRR on the Brownsville Subdivision between Victoria and Robstown, TX (more than 250 miles west of Beaumont). The KCS is currently operating as many as seven to nine trains in each direction on the Brownsville Subdivision while the UPRR typically has five to six trains. Consequently, lesser priority trains are often held at Vidor, sometimes for eight hours or more. Occasionally trains are tied up in sidings east of Vidor at the next meeting point in Mauriceville, TX ten miles to the east.

#### ***Union Pacific Railroad's Yards***

UPRR has two yards, the South and East Yards, within the study area yet its largest yard, the Beaumont Yard, is located west of Interstate 10. All of these yards are shown in Figures 2.28a through c. The East Yard is approximately 3,000 feet long and has as many as seven parallel tracks. Portions of this yard and several industry leads are elevated over 4<sup>th</sup> Street. The South Yard, along UPRR's line to Port Arthur, is approximately 2,500 feet long and has as many as five parallel tracks. The yard stretches from Crockett Street to College Street (US-90) and two tracks cross College Street at-grade.

The majority of through UPRR trains change crews on either of the two main tracks at their switching yard west of downtown Beaumont. The present practice is for these trains to stop and occupy one of the main tracks while the crew change takes place. The crew change takes a minimum of 30 minutes, but can take much longer, e.g., up to two hours, if the trains also are required to set out cars or pick up cars. When this happens, following trains are often delayed as well. UPRR trains (for both directions) change crews at their yard several miles west of the Neches River Bridge. The mainlines are not always clear for trains to enter westward due to switching operations or other trains ahead changing crews. The dispatcher cannot send a following train movement across the bridge until the signals ahead can be cleared in order that the following train will not stop on the bridge. The result of this is that the following train movements in both directions are spaced at least eight to ten minutes apart assuming the train ahead is kept moving.<sup>17</sup>



**Figure 2.28a – UPRR South Yard**



**Figure 2.28b – UPRR East Yard**



**Figure 2.28c – UPRR Beaumont Yard**





The BNSF Beaumont Yard is located in the northwest area of the study boundary and is shown in Figure 2.29. It essentially encompasses a 3,500 foot length from North Street north to a point north of Interstate 10 just outside the study area. There are as many as fifteen parallel tracks, plus service via industry leads to the west parallel to 1<sup>st</sup> Street along the former Rock Island branch.

**Figure 2.29 – BNSF Beaumont Yard**



## Observations

As a network, the rail transportation system is directly influenced by operations outside the limits of the study area. To better understand the current operating challenges being faced by the railroads along the corridor, the study team was granted access to the KCS Dispatch Center in Kansas City, Missouri. Operations were observed on two separate occasions for a total of 12-hours on September 12 and 13, 2011. These observations allow for several suggestions for potential operational improvements. In summary the field observations conclude:

- At the present time, neither bridge capacity nor the operation of the Port of Beaumont are a problem in terms of rail operations
- Currently, yard capacity and crew change locations in and around the Beaumont area present obstacles to efficient rail operations.
- Congestion at the Houston terminal also has a negative impact on rail operations in Beaumont, i.e., crew calls may not be made until trains are ready so as to not lose crews between Houston and Beaumont.
- While the operations of the Port and bridge capacity are not problems today; they may become more problematic as rail traffic increases.

Efforts have been made to improve coordination and communication between the various dispatchers to help operations; this should continue.

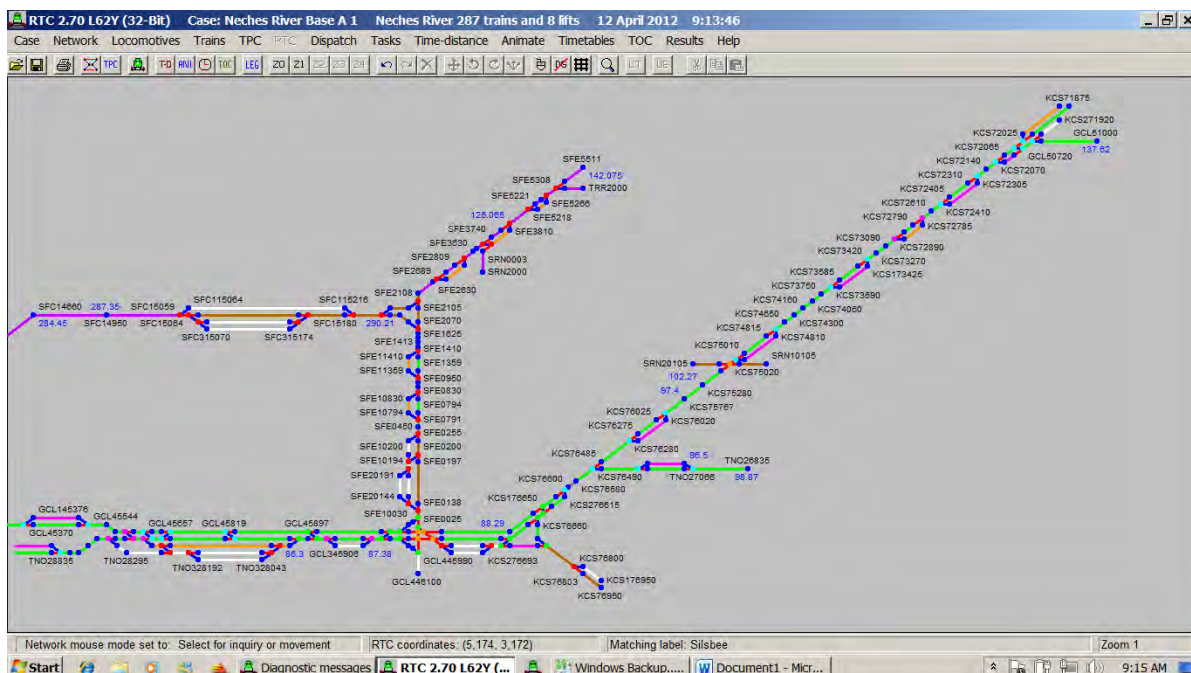
## The Rail Traffic Control (RTC) Model

Rail Traffic Controller (RTC) is a computer program created by Berkeley Simulation Software, LLC, which simulates the operation of trains over a railroad network. Variations can be made in network track layouts, train composition and schedules, and operating rules and constraints, which allow for the testing and assessment of modifications. RTC is used by most North American Class I railroads to evaluate and plan their operations and in turn determine capital expenditures.

The “base case” model represents current conditions which are then validated by comparing results to known current system performance. The better the base case model matches current system performance, the more confidence one can have in the results for a planning scenario. The measured part of the Neches River base case network is bounded on the east by KCS MP 735.85 (the west fols at Starks, Louisiana) and by Texas and New Orleans (T&NO) MP 268.35, east of Connell; and on the west by Gulf Coast Lines (GCL) MP 456.00 at Elizabeth, and T&NO MP 283.04, at the west end of Beaumont. A schematic of the Neches River “line” is shown in Figure 2.30. The UPRR and KCS yards at Beaumont are included in the Neches River "line", which is a subset of the entire network used to measure train performance that is directly affected by the Neches River bridge. The BNSF yard at Beaumont is not within the Neches River line. The simulation model consists primarily of two files:

- **Network files** which include track, signals, grades, curves, bridges, road crossings, and railroad junctions or interlockings and
- **Train files** which include information related to individual trains – their identity, type, weight, length, locomotives, time and day of operation, relative priority, origin and destination, route, railroad carrier, and intermediate work, if any.

**Figure 2.30 Rail Traffic Control (RTC) Neches River “line” schematic**



In all simulation cases, each train is treated individually. In other words, as no two days in the real world are identical, no two days in the model are identical. Some freight trains operate on completely random schedules, according to traffic demands; or according to availability of resources, such as locomotives and crews. The 2007 base case simulation network was constructed largely from railroad “track charts” supplied by the carriers. These schematic maps show the physical track in sections allowing the modeling of signals, switches, grade crossings, sidings, and yard tracks as well as distances and grades between points. These charts, along with railroad timetables, also show the speed limits for trains on the various sections of the network. The base case train files were constructed from two sources. The first is railroad records of through train movements. These records are taken from the dispatching system and include the identity of the train, its consist, its route, and the day and clock time when it passed certain key recording points. In addition, train data from earlier RTC model runs executed as part of the 2010 Texas Statewide Rail Plan was extrapolated to the Beaumont area network.

The base case includes the operations of 287 total freight trains in a week . In addition, there are six Amtrak passenger trains measured (three eastward, three westward), though these passenger trains are excluded from the freight statistics. The measured freight trains for the simulated week break down by type of train are shown in Table 2.2.

**Table 2.2 – RTC Model Base Case – Type of Trains**

BY TYPE	BNSF	KCS	UP	Total
Manifest	35	53	67	155
Priority Manifest			45	45
Expedited	11		19	30
Grain		12		12
Vehicles/Auto Parts			5	5
Coal	2			2
Other Unit	2	14	6	22
Local			16	16
<b>TOTAL</b>	<b>50</b>	<b>79</b>	<b>158</b>	<b>287</b>
	17%	28%	55%	

There are eight bridge openings during the week, ranging in length from 17 minutes to 31 minutes in length. The openings are randomly distributed during each day, although none are coded to take place in the early morning (between 1 AM and 4 AM) assuming that no water movements would occur during those hours.

RTC is designed to measure railroad performance in time. Some measures are “absolute” numbers while others are ratios of performance. The performance measures used here include:

- **Train Count** – the number of trains over a period of time, here a week, measured in the model. This number is always less than the number of actual trains in the case. Trains that do not complete their entire run within the measured time period are excluded from the statistics.
- **Average Speed** – the average operating speed, in miles per hour, of the measured trains operating across the entire network, or across a specific part of the network.
- **Delay Ratio** – This is the ratio of congestion-related delay to an “unimpeded” running time. Unimpeded time equals the time it would take to operate all the trains, including any en-route work needed or requirements that must be met, without any congestion-related delay.
- **Delay Hours/Day** – This is the absolute number of train-hours per day lost to congestion-related delay. In general if delay hours can be reduced, costs can be reduced. However the value presented here does not differentiate say between 100 loaded cars of time-sensitive freight from a local switching 20 cars.
- **Delay Minutes/100 Train-miles** – This is an alternate, railroad industry measure of normalized delay. It functions much like the delay ratio (the numerator is actually the same, except reduced to minutes instead of hours); but the denominator is the distance trains travel over time, rather than just the time itself. These ratios can often be high in terminals.

Table 2.3 summarizes the base case train performance over the week long period for the above referenced performance measures. The Base RTC model included 44 lifts per week on the Neches River bridge crossing. Information from various other sources suggested that the number of lifts on a typical week was significantly less; say on the order of eight (8) lifts per week. Consequently the RTC model was rerun with 8 lifts per week and represents the Base (modified). Even with a significant reduction in the number of bridge lifts in the existing conditions analysis, the delay performance measures exhibit relatively minor shifts, though of course in the positive direction, speed increases while delays decrease. Overall changes in terms of speed are very minor on the order of 2%, while delays typically drop by 9%.

**Table 2.3  
RTC Freight Train Performance - Base Case**

Case	Train Count	Average Speed (mph)	Delay Ratio	Delay Hours / Day	Delay Minutes / 100 Train-Miles	Bridge Lifts per Week
Base	287	14.7	25%	9.9	67.0	44
Base (modified)	287	15.0	23%	9.0	61.1	8



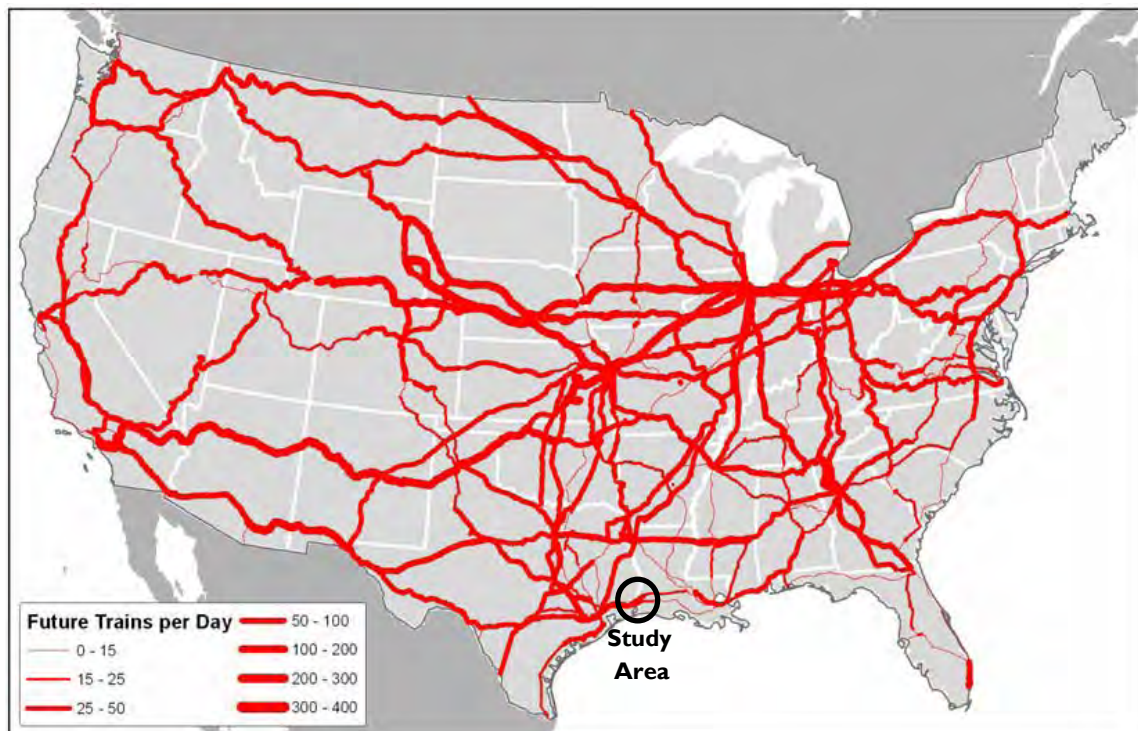
### 3.0 Projected Conditions

This section discusses rail forecast to the year 2035 under the no-build scenario. Then with an assessment of operations, various improvement concepts are developed and assessed. A key element with any improvement concept is the crossing of the Neches River with regards to meeting the criteria for river navigation. The parameters for different types of bridge crossings are discussed first followed by descriptions of potential alignments.

#### Rail Forecasts

The study area's rail forecast includes an overview of rail traffic at a national level as well as specific to the region based upon the Texas State Rail Plan. Consideration is also given to the Gulf Coast High Speed Rail passenger initiative. Operations for Beaumont area rail system were conducted for the no-build scenario which utilizes the existing rail network and committed improvements, such as the new switch into the Port of Beaumont. In general, rail traffic throughout the nation is projected to increase as shown in Figure 3.1 which includes the rail corridor through Beaumont.

**Figure 3.1 – Future Daily Train Volumes - National**



#### Projected Rail Traffic Volumes

The Base (Modified) RTC model estimates that under current conditions 287 trains operate during a typical week through the Beaumont rail network. This translates to approximately 40 to 50 trains per day crossing the Neches River. Forecasted growth for the number of trains expected to be operating

weekly in the Beaumont area by 2035 was increased from the base case utilizing a three percent (3%) compounded annual growth rate and is shown in Table 3.1. The 3% growth rate is reasonable given the population growth forecasted for the State of Texas and the expected increased level of cross-border trade on a national basis. In addition, this is the rate that other recently completed freight studies used. Train traffic is projected to essentially double during this time period with an estimate of 87 trains per day crossing the Neches River. These forecasts utilize the same distribution by rail carrier as current conditions. Similarly, the growth rate can be applied to the type of trains as previously shown in Table 2.2.

**Table 3.1  
Forecast of Weekly Train Traffic**

Carrier	2011	2035
BNSF	50	102
KCS	79	161
UPRR	158	321
<b>Total</b>	<b>287</b>	<b>584</b>

Rail traffic at the Port of Beaumont is expected to grow as well. The Texas Rail Plan (TRP) reports that the number of containers handled at the Port of Beaumont is forecasted to increase 34 percent while an increase of 60 percent is forecast for tonnage.<sup>25</sup> Forecasts for number of rail cars and tonnage handled at the Port by carrier are shown in Table 3.2. Much of the growth at the port is likely to occur on the Orange County side of the Port, as noted in the discussion of the Port's Master Plan in earlier sections. Consequently, bridge lifts were increased in the same ratio (doubled) to account for potential expansion of the Port of Beaumont's Orange County facility to the north of the existing KCS river bridge.

**Table 3.2  
Port of Beaumont - Forecast of Annual Rail Cars and Tonnage Handled**

Carrier	Annual Rail Cars		Annual Tonnage (millions)	
	2008	2035	2008	2035
BNSF	164	220	4.1	6.5
KCS	1,312	1,763	32.6	52.0
UPRR	1,804	2,424	44.8	71.5
<b>Total</b>	<b>3,280</b>	<b>4,407</b>	<b>81.4</b>	<b>130.0</b>

### ***Gulf Coast High Speed Rail Corridor***

In 1998, then U.S. Transportation Secretary Rodney Slater designated the Gulf Coast High-Speed Rail Corridor (GCHSR) which would serve the states of Texas, Louisiana, Mississippi and Alabama with "spokes" extending to Houston, TX, Mobile, AL, Birmingham, AL, and Atlanta, GA as shown in Figure 3.2. The route would connect with the proposed Southeast High Speed Rail Corridor, which extends

to Charlotte, NC, Richmond, VA, and Washington D.C. Prior to this initiative, other efforts were conducted. Aside from the States of Louisiana and Texas studying the corridor, no planning or construction has been done on the Gulf Coast corridor to date mainly due to funding constraints. In addition, the route has experienced decreases in available capacity because of increased freight traffic. The report suggests that before high speed rail can be introduced, overall capacity needs to be improved by establishing a double track mainline operation and the track will need to be upgraded to Federal Railroad Administration (FRA) Class V standards to allow for higher speeds. A three phase implementation plan is proposed on the corridor between Houston Amtrak station and the Louisiana/Texas State line near Echo, Texas. The phases are summarized:

1. Phase One – provisions for the upgrade of several segments of the existing track to facilitate 79 mph operations at an anticipated cost of \$150 million.
2. Phase Two – provisions for increasing the amount of capacity by establishing a double track mainline operation throughout the length of the corridor at an anticipated additional cost of \$473 million.
3. Phase Three – provisions for increasing operating speeds to 90 mph (track maintenance at FRA Track Class V standards) at an anticipated additional cost of \$93 million.

**Figure 3.2 – Gulf Coast High Speed Rail**



Schematic plans of the GCHSR corridor in the Beaumont area are provided in the Appendix and are reproduced at a conceptual level on the Alternatives Evaluated maps as applicable.

Recently the USDOT announced it was awarding \$15 million in high speed rail funds, being redirected from Florida, to Texas. The state will use the money to conduct engineering and environmental work to develop a high-speed rail corridor linking Dallas/Fort Worth and Houston. The City of Beaumont is not within that corridor.

### **Operations**

The forecasted train traffic results in a significant increase in the delay hours per day as well as the delay minutes per 100 train miles for the project study area. The forecasted delay hours increase by a factor

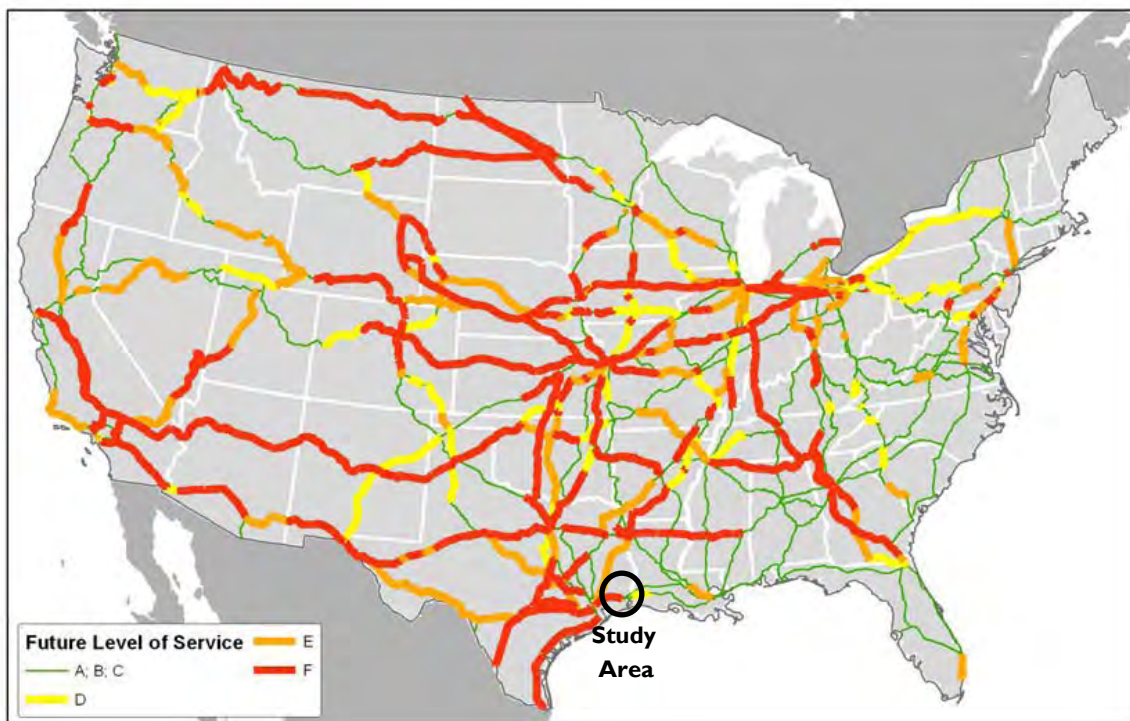
of eight while the delay minutes increase by a factor of five under the no-build conditions. Essentially, the application of the forecasted train volumes to the existing rail network results in significant congestion. However, this is consistent with other studies regarding future levels of service for freight rail at the national level. This delay noted in this report is for those trains operating or projected to operate within the limits of the Beaumont RTC model network.

**Table 3.3  
RTC Freight Train Performance – Projected “no-build”**

Case	Train Count	Delay Hours / Day	Delay Minutes/100 Train-Miles	Bridge Lifts per Week
Base (modified)	287	9.0	61.1	8
Projected "no-build"	582	69.7	306.4	16

An assessment of operations under current rail infrastructure with future train volumes indicates a significant portion of the national rail network to approach capacity or operate at capacity as shown in Figure 3.3. Again, the rail corridor under study here is shown at capacity essentially for the segment within the study area.

**Figure 3.3– Future Level of Service – National**





Several physical transportation improvements are also anticipated as projected year assumptions that are included with the projected base case. These are:

- Interstate 10 bridge over Neches River expanded to eight lanes, approximately 30 feet to the south from current conditions.
- Port of Beaumont's south switch is operational and the Interchange Yard is removed.
- The BNSF connection to the Port of Beaumont across the KCS remains.
- The Gulf Coast High Speed rail corridor is preserved, if it is not already implemented.

## Developing Options

The development of options can be thought of in two basic parameters:

1. the development of bridge type (stationary or lift) and
2. the development of bridge crossing locations (along existing or on new alignment).

The determination of bridge type also influences the location of the bridge crossing. The stationary bridge type could consider three levels; a high level, a mid-level and a low-level. A high-level bridge would accommodate the vertical clearance for river navigation for a maximum height (150 feet). A mid-level bridge provides a vertical clearance to accommodate the majority of river navigation as is the case with the 50 foot vertical clearance defined by the IH-10 crossing of the Neches River. A low-level crossing assumes a lift bridge with a minimum 13 foot vertical clearance in the closed position (to mimic the existing KCS bridge vertical clearance).

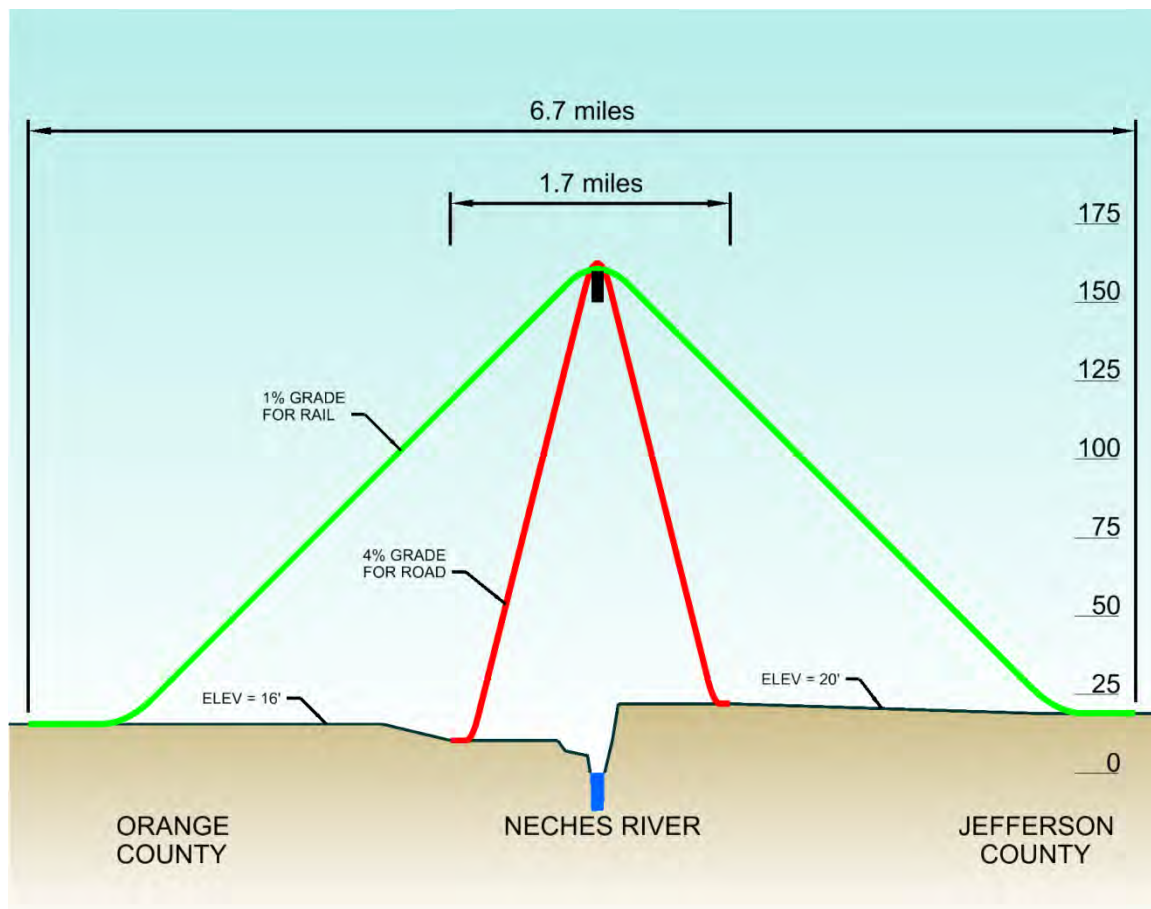
A high-level crossing could essentially occur at any location, yet the practicality of this concept needs to be called into question. A quick review of the Neches River navigation system notes several "crossings" and their associated vertical clearances which are shown in Table 3.4.<sup>26</sup> These crossings are listed in navigation mile markers from the south to the north. Of the crossings, several are overhead power transmission cables. Only three are vehicular bridges and only one (the KCS bridge) is a rail bridge. National Oceanic and Atmospheric Administration (NOAA) lists the following vertical clearances for elements crossing the Neches River:

**Table 3.4 – Vertical Clearances along Neches River**

Neches River	Mile Reference	Vertical Clearance (feet)
Road bridge - TX 73 EB	0.0	172
Overhead Power Cable	0.0	164
Road bridge - TX 73 WB	0.0	143
Overhead Power Cable	1.9	183
Overhead Power Cable	10.2	172
Overhead Power Cable	16.0	172
Rail bridge - KCS	19.5	13/150
Road bridge - Interstate 10	21.4	50

Port Arthur has State Highway 73 over the Neches River with a vertical clearance as high as 172 feet. This highway structure is nearly 1.5 miles long with an approximate approach grade of four percent. Railroads require a maximum grade of one percent and thus would have a significant increase in the length of structure for such a high-level clearance. An illustration of a theoretical high-level bridge over the Neches River in Beaumont is shown in Figure 3.4. It includes for comparison purposes a schematic profile with grades at four percent (for a highway) and at one percent (for rail). The length of the rail profile and associated structure would extend for a length of approximately 6.7 miles utilizing terrain in the Beaumont area along the existing rail corridor. Of course, no other rail connections serving Beaumont could be achieved along this aerial structure and the excessive costs of such a high-level crossing make the concept impractical.

**Figure 3.4 Conceptual High-Level Profile**



A tunnel option could also be contemplated. The vertical distance below the depth of the dredged channel including the vertical depth of rail tunnel would be approximately half the height of an elevated structure and therefore have approximately half the length of approach grade. Nonetheless the water table, soil condition, the need for ventilation and potential for flooding of the tunnel make such a concept impractical. However, from an operational perspective, the effects of a high-level bridge can be

assessed by running the RTC model on a theoretical rail network with zero (0) bridge lifts. This will allow an assessment and isolation of the operational impacts based upon bridge lifts as well as the opportunity for sensitivity analysis by varying the number of bridge lifts.

A mid-level crossing with its 50 foot vertical clearance (stationary bridge) is essentially defined as being adjacent to (and along the south side of) the existing Interstate 10 crossing of the Neches River.

A low-level crossing could essentially occur at any location. However, it needs to be acknowledged that at points south of the existing river bridge additional lifts would be required as the Port of Beaumont has much river traffic that accesses the Port. At points north of the existing bridge, the same number of lifts would be required as occur at the existing river bridge. In terms of navigation distance there is a limited length between the rail bridge (Mile 19.5) and the Interstate 10 bridge (Mile 20.7). Consequently as any new river crossing is physically close to the existing bridge, it can be assumed that operationally both bridges may be open at or nearly at the same time. This in turn essentially creates a system interruption in the network similar to what occurs today.

In developing design parameters to determine potential locations for alternative alignments and bridge crossings of the Neches River, the vertical clearance over the river as a navigable waterway becomes critical. Information on vertical clearance was received from the United States Coast Guard (USCG) which states: “The existing vertical lift railroad bridge across Neches River at mile 19.5 in Beaumont has a horizontal clearance of 200 feet and a vertical clearance of 13 feet above high (underline added) water in the closed position and 145 feet above high water in the open position. The existing clearances have been adequate to date, as we have not received any complaints from waterway users. “

Copies of drawings for the Neches River rail bridge, dated 1940, were obtained from KCS. These drawings confirm a horizontal clearance of 200 feet yet state a vertical clearance of 18.32 feet above the mean low water (elevation + 2.68) in the closed position and 150 feet above the mean low water in the open position. A note on the drawings adds that elevations provided are from the KCS datum and are in feet above M.G.L., Biloxi, Miss. elevation +2.68 KCS datum equals elevation 0.00 U.S. datum. Review of the vertical clearances in the closed and open positions suggests that the “water surface reference” (elevation datum) has changed since the Neches River rail bridge was constructed. Comparison to the IH-10 bridge crossing presents similar references to mean low water for clearance and notes a 50 foot clearance at IH-10. Mean low water is designated at elevation 0.30.

Equally important to evaluating the feasibility of the physical aspects of a new river crossing is the electronic contour information used to establish existing and proposed profiles. Based upon the electronic contour files, the known junction point of the KCS and UPRR rail lines (near Tower 31) is shown at elevation 14.6. Track chart from the KCS call out an elevation of 18.0 at this point which would include the difference in datum elevation for the KCS. The water surface elevation for the Neches River is shown at elevation 0.0. Consequently for the purposes of this study, the stated vertical clearance of 50 feet for the IH-10 bridge is proposed for this conceptual design. Later on should the concepts proceed to any further design level, additional and more detailed topographic data will be collected and coordinated through the various review agencies including the U. S. Army Corps of Engineers.

At the existing Neches River rail bridge location, the navigation channel is skewed to the alignment of the railroad bridge. The skewed width of the navigation channel with an allowance for a fendering system and support piers requires center to center pier spacing greater than the 200 foot minimum horizontal navigation channel clearance. Consequently the center pier spacing was lengthened for initial investigations. In order to provide for potential future expansion, the typical bridge sections were designed to accommodate a double track section with a center to center distance of 15 feet.

If a new alignment were to span land owned by the Port of Beaumont on both sides of the Neches River, a new roadway crossing has been requested by the Port in addition to a rail crossing. Therefore, a bridge section to accommodate both rail and highway traffic was developed. To avoid any at-grade crossing of the new rail line, the two-way vehicular roadway would be placed adjacent to the rail bridge. In the case of a lift bridge option, a separate two-way roadway lift bridge would be needed to be constructed adjacent to the proposed rail bridge in order to provide a balanced typical section for the lift bridge support structure. Later in the “alternatives considered” section and eventually the “alternatives evaluated” section of this chapter, a vehicular circulation concept is illustrated (see Exhibits 2 and 3 in the Appendix) that includes a crossing of the Neches River as well as a grade separation over the KCS rail corridor connecting the two Orange County parcels of the Port of Beaumont.

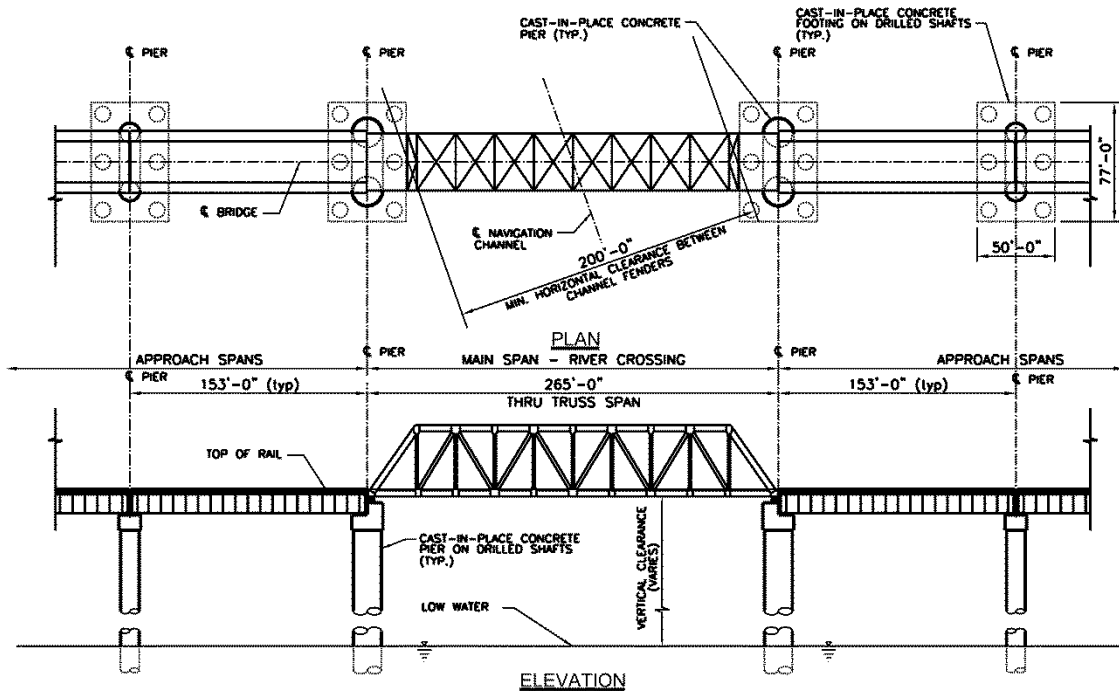
Several options were considered including a stationary bridge (navigation clearance level to be determined based upon river crossing location) and a lift bridge. Again, the lift height will be dependent upon the river crossing location. In general, any point south of the existing river bridge should provide the 150 foot clearance as currently provided. Points immediately north of the existing bridge (at least to the limits of the dredged channel) should also provide the 145 foot clearance above high water. Immediately adjacent to the IH-10 bridge (approximately 1.7 navigation miles north of the KCS rail bridge), a lower clearance can be used to match the existing clearance afforded by the IH-10 structure (50 feet above mean low water). NOAA indicates the limits of the dredged channel to be approximately 0.8 navigation miles north of the existing KCS rail bridge.

### **Stationary Bridge**

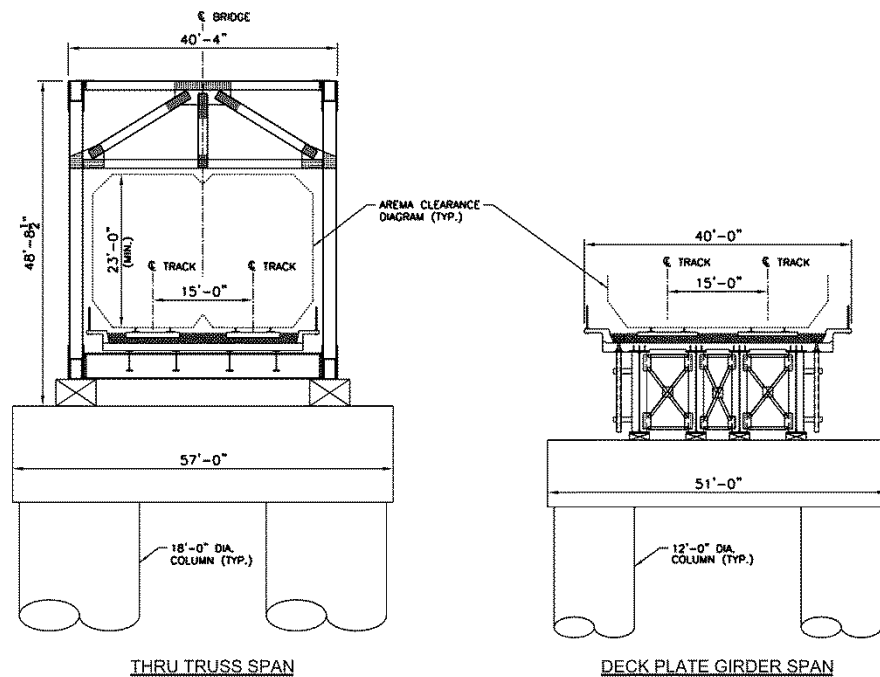
For planning purposes, the Neches River bridge as a stationary bridge would consist of a 260' – 0" double track thru truss main span, with a composite concrete deck, and 153' – 0" welded steel deck plate girder spans with a composite concrete deck for both approach spans. The main span will provide a minimum horizontal clearance of 200 ft. with 265' – 0" pier spacing to account for a skewed navigation channel. Piers for the bridge would be a cast-in-place concrete pier cap, two concrete columns, with a cast-in-place footing supported on drilled shafts. The approach spans, outside of the river floodway, would be either pre-stressed concrete modified AASHTO I girder spans or welded steel deck plate girder spans. Piers would be a cast-in-place concrete pier cap, with two concrete columns. Depending on the height of the columns; they will be either supported on a cast-in-place footing supported on drilled shafts or supported directly on drilled shafts. The span lengths and girder type could vary depending on the approach alignment, topographic and other environmental/hydraulic constraints. Illustrations of a stationary bridge with general plan and elevations as well as a typical section are shown in Figures 3.5 and 3.6.



**Figure 3.5 – Stationary Bridge General Plan and Elevation**



**Figure 3.6 – Stationary Bridge Typical Section**



A stationary bridge at the 145 foot vertical clearance above high water would be excessively long and by definition extremely expensive. The Rainbow bridge (for vehicles) in Port Arthur provides the navigation clearance for the Neches River. The total length of the bridge is over 1.5 miles. The grades on the approach spans are estimated at four percent. The maximum grade for the rail would be one percent resulting in a comparable length of nearly six miles. Consequently, consideration was also given to establishing an elevation of the bridge in the closed position that would allow say 80 percent of the navigation traffic to pass under the bridge without requiring a lift. Several factors are required to establish this elevation; the appropriate reference water surface elevation, the height of boats using the river and an acceptable minimum clearance allowing boats (and its tow) to pass without requiring the bridge to be opened. Setting this elevation would require coordination with the U. S. Army Corps of Engineers and the U. S. Coast Guard. Lift data from the KCS railroad indicates that the maximum height requested on one occasion (during a sample week) was 70 feet. This height is higher than the clearance afforded by the IH-10 bridge. The average lift request (mathematically) was for 48.6 feet. Only three of the seven lifts requested that week were below 50 feet.

### **Lift Bridge**

This option would be similar to the existing bridge though the new bridge would be capable of supporting two main line tracks, and would be longer to account for the skewed width of the wider double track truss and the larger piers needed to support the additional weight of the second track. A vertical lift bridge typically offers several advantages. For span lengths greater than 150 ft. a steel through truss, vertical lift bridge is the typical structure type used for railroad movable bridges. An open deck system (timber ties supported on steel stringers and floor beams) is recommended to reduce the weight for the lift span. A ballasted deck system would approximately double the span's weight.

Some advantages of vertical lift bridges include:

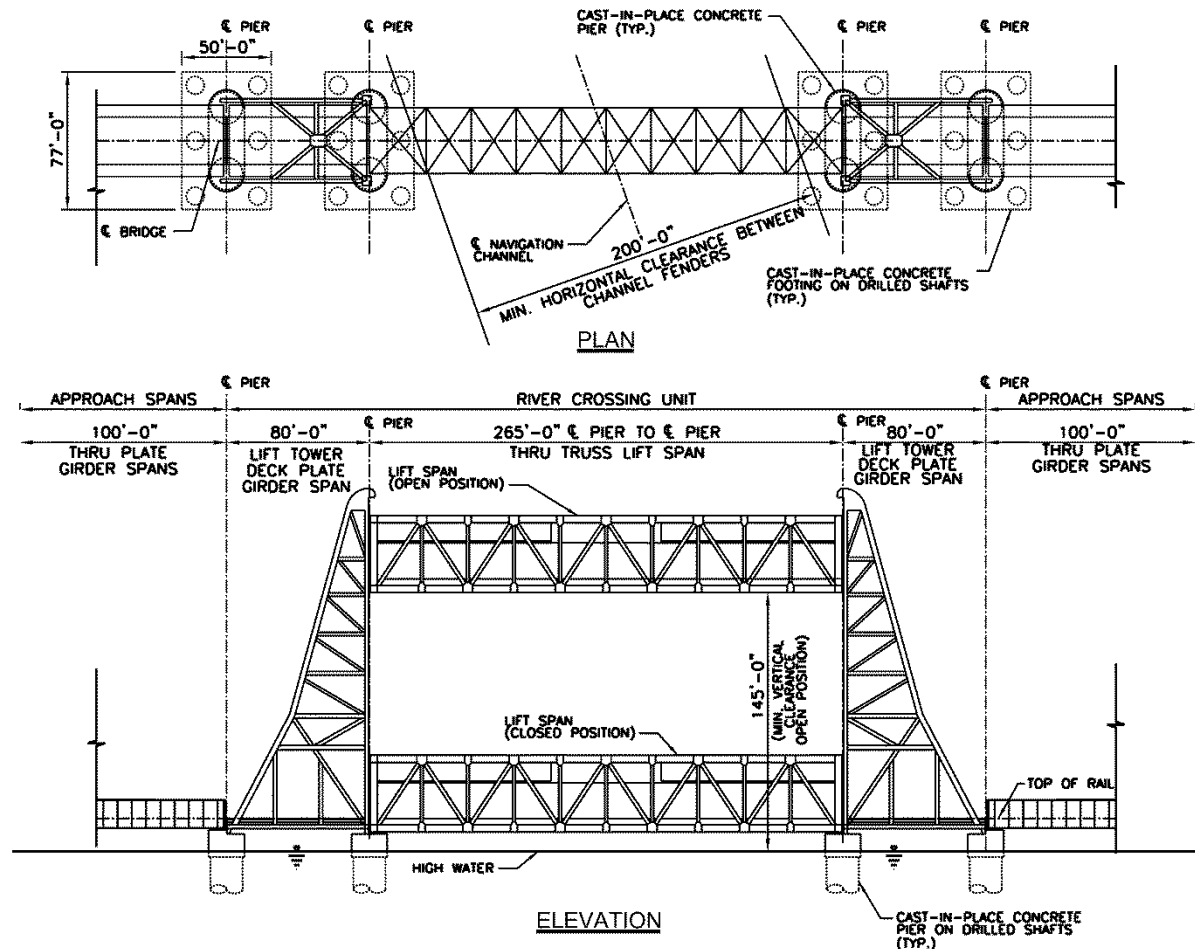
- Longer span lengths and wider navigation openings can be achieved more easily than with other movable span types (i.e. swing or bascule spans).
- The lift span is a standard design (simply supported span), similar to a stationary bridge.
- It is conceivable to design the lift span with a ballasted deck.

Some disadvantages of vertical lift bridges include:

- Towers are required to lift the vertical span and access to the top can be difficult especially on towers approaching 200 feet in height. Service elevators can be provided for tower driven spans that require frequent access to the top.
- The mechanical and electrical systems require periodic maintenance.
- Providing a sufficient number of adequately sized counterweight ropes, a flexible power cable, a large enough sheave groove radius, and adjustable rope termination take-up devices must be considered in the design.

A general plan and elevation as well as a typical section of a lift bridge are shown in Figures 3.7 and 3.8.

**Figure 3.7 – Lift Bridge General Plan and Elevation**

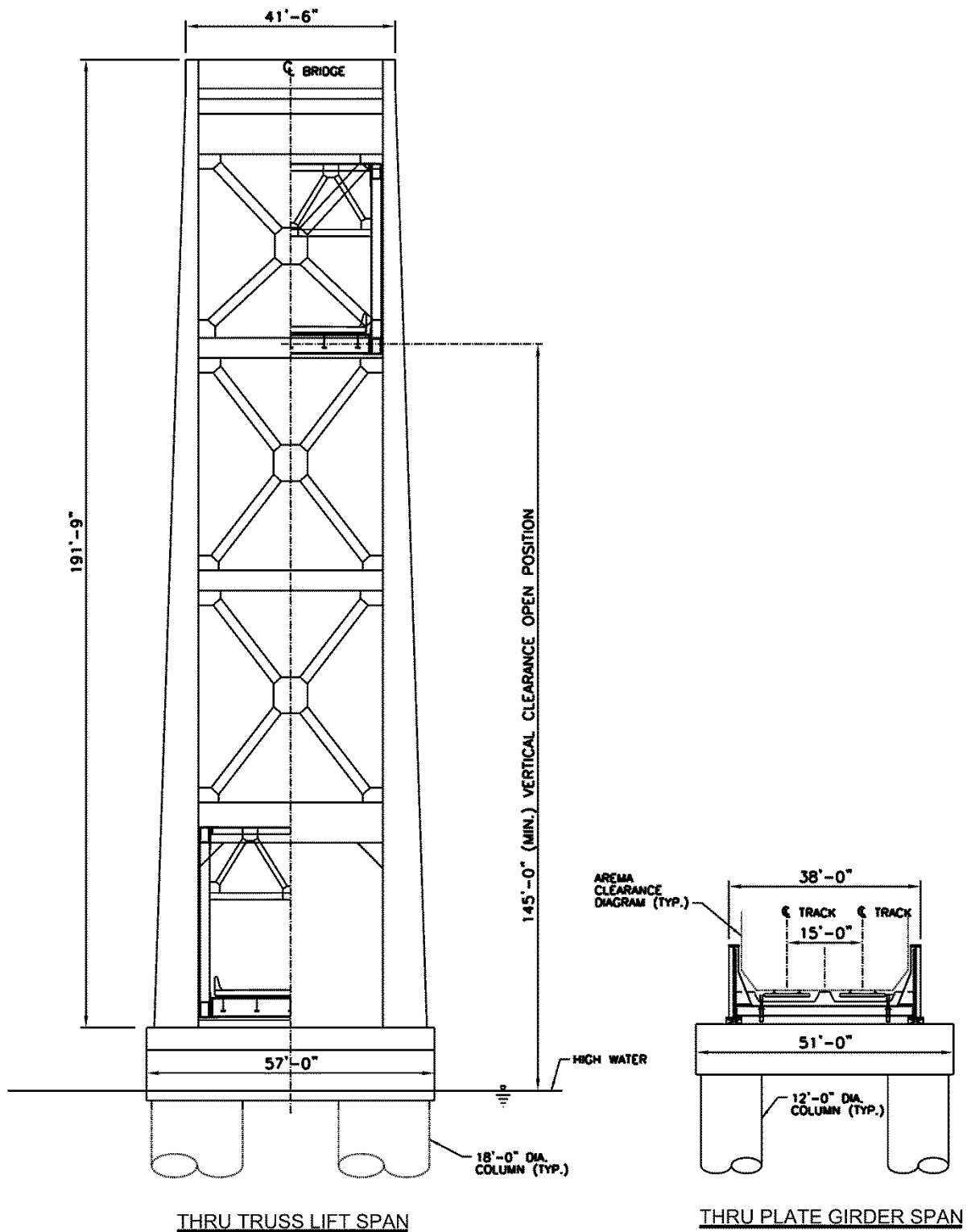


The piers adjacent to the navigation channel require a fender system to protect the bridge from vessel impact. Movable bridges are particularly susceptible to service interruptions as a result of vessel collision. Even minor impact on the substructure can cause mechanical equipment to fail.

From a review of the existing Pier Plan – Profile Sheet, dated Feb. 1940, it appears that the channel was about 30 foot deep measured from low water (KCS datum). The boring logs indicate that between elevations -38 to -124, the soil profile consists of alternating layers of hard to very hard clays and coarse to course packed sand. The foundations for the 1940 construction consisted of caissons or drilled shafts varying from 7 to 18 feet in diameter. The estimated tip was at elev. -90. For tall columns, those exceeding 30 feet  $\pm$  above ground line, the columns are to be supported on a concrete pile cap or footing founded on drilled shafts. For columns less than 30 feet  $\pm$  above ground line, the columns are to be supported directly on the drilled shafts or on pile footings. Because of the heavier loads anticipated from the new construction, it is estimated that the tip for drilled shafts to be elevation -110.



Figure 3.8 – Lift Bridge Typical Section



The United States Corp of Engineers will require that the low steel elevation of the approach spans be a specified distance above the high water elevation. To provide a smaller structure depth (top of rail to low steel), through plate girder spans will be used within the river floodway. The approach spans, outside of the river floodway, would be either pre-stressed concrete girder spans, or steel deck plate girder spans or thru plate girder spans. The span lengths and girder type could vary depending on the approach alignment, topographic and environmental / hydraulic constraints. The costs for the stationary and lift bridge options were developed in two forms; the span over the navigation channel and the unit costs for the approach spans assuming a consistent uniform length. This format was deemed suitable for initial considerations. Outside of the river, the span lengths and girder types will vary to provide the most cost effective combination. The costs include the potential for a variety of structural types such as cast-in-place and pre-cast, pre-stressed concrete spans, and steel deck plate girder and through plate girder spans. The costs do not include truss spans, because of the variation in types and lengths, nor for foundations in water requiring special construction techniques. Such costs would be identified at a later stage of design as a separate line item. With specific horizontal and vertical alignments across the Neches River, an accurate length of the bridge approaches and associated probable costs will be determined.

Whether the main span over the navigation channel were constructed as a stationary bridge or as a lift span, the span length of the thru truss element would be set to allow a 200' – 0" minimum horizontal clearance between the navigational channel and fendering system. Because of the potential for skewed alignment crossings of the river, the actual length of the thru truss span may be longer. The approaches in the river would typically be 150' long welded deck plate girder spans. The estimated probable construction cost (in 2012 dollars) of the stationary river bridge is on the order of \$30 to \$35 million. The lift span over the navigation channel will be constructed to a minimum of 13' above the mean low water level. Because the minimum navigation vertical clearance required is 150' above mean low water, a lift span is required. The estimated probable construction cost of a lift span bridge is on the order of \$40 million for a single track and up to \$80 million for a double track. If the vertical clearance over the river in the fixed position were higher than 13 feet which in turn reduces the total lift, then the cost of the lift span bridge may be less. This opinion of probable costs are for construction elements only and do not include costs for engineering design, permitting, or construction inspection services.

## **Alternatives Considered**

The alignment location must pass three elements to determine feasibility, an initial review of the technical aspects (typically related to the physical environment), then a financial feasibility test with reasonable costs, and finally a political feasibility where potential impacts are not significant and there is support from applicable partners. Conceptually any new alignment must connect to the existing rail system. For this study area that essentially means connecting from a point near Tower 31 (KCS/UPRR split in Orange County) to the Union Pacific overpass of 11<sup>th</sup> Street near the existing Amtrak station. To assist in reviewing the location and the surrounding context of the alternatives to be evaluated, see Figure 3.9. A series of 1" equals 200' scale aerial maps of the alternative alignments are included in the Appendix.

For a stationary bridge concept, the alignment location begins by setting the bridge location and then attempting to create the appropriate tie-ins on the east and west sides of the Neches River crossing. For lift bridge concepts, a combination of rail alignment and river crossing location (for navigation traffic and minimizing span length) are given consideration. Operations and connections are also considered when creating the overall rail alignment. The descriptions follow the railroad mileposts which typically increase when travelling westward.

### **Stationary bridge**

The initial alignment developed for a stationary bridge attempts to create a crossing where interruptions from navigation traffic do not occur. The best location for a stationary bridge is north of the existing KCS bridge near the existing IH-10 bridge over the Neches River. Here, the closest existing rail corridor to IH-10 on the west side of the Neches River is the BNSF spur to and through the Port's interchange yard.

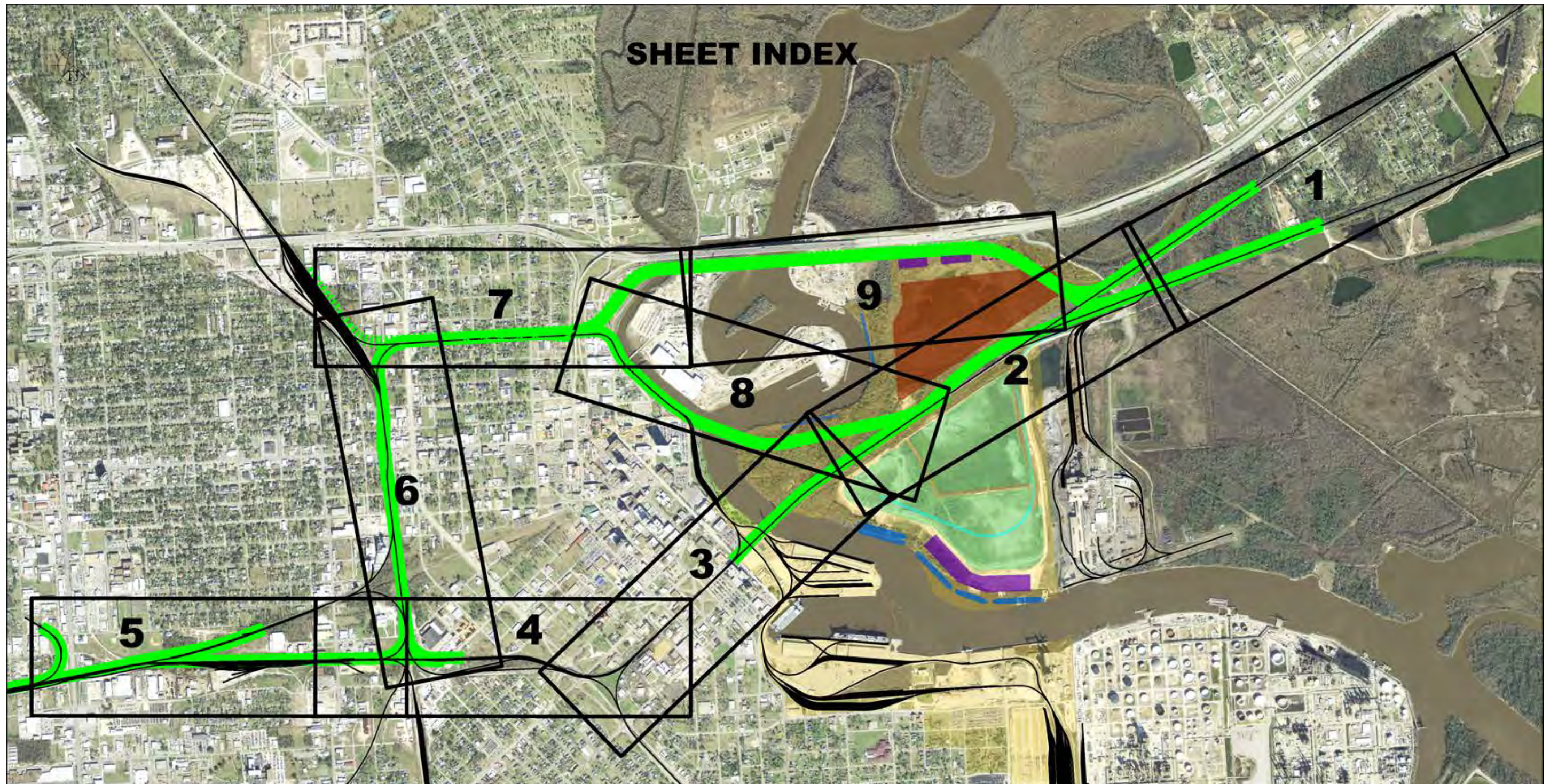
On the east side of the Neches River, the KCS/UPRR split at Tower 31 presents a challenge in connecting to both the KCS and UPRR lines which are diverging. In order to create an appropriate crossover, a grade separation is envisioned. Since the bridge location under consideration is north of the existing KCS line, then the KCS line is to be crossed. The vertical design criteria at this concept planning level is set at 24 foot vertical clearance from the top of rail plus an assumed six foot depth of structure, for a total of 30 feet. The maximum grade is one percent and in general this would mean a 3,000 foot long transition. The straight line distance from the UPRR split to the IH-10 bridge is over 5,500 feet.

The horizontal alignment is conceived to be parallel to the existing track when applicable. The UPRR line includes a new second track as previously described under the Gulf Coast High Speed Rail (GCHSR) initiative. While this initiative may not yet be a committed or funded project, for purposes of a long range planning study, the new rail is shown as an element to be considered and requires coordination. The GCHSR line is shown on the north side of the existing UPRR tracks. Track centers are depicted at 20 foot centers. The spacing of track centers changes to 15 feet on center when the rail is on a structure. This change in dimension is made as a cost-sensitive design. Consequently the new alignment track would run parallel on a retaining wall section close to the proposed GCHSR track before connecting to that track. An access road on embankment is possible on the north side. However, Baird's Bayou and the existing timber viaduct structures on the order of 900 feet for UPRR and 1,000 feet for the KCS would indicate that a structural support system is needed for a portion of the track before transitioning to retaining walls and embankment.

The east tie-in is also further complicated by the at-grade crossing of Old US-90 on the KCS line. A more desirable situation would be a grade separation of this roadway and the KCS tracks. That would necessitate either raising the existing KCS track over Old US-90 or bringing Old US 90 over the KCS tracks. While the road structure would typically be less expensive than a rail structure, the proximity of Baird's Bayou as well as maintaining access across the UPRR track to George Brown Road and access to the Gerdeau Steel complicates any grade separation. In other words, the close proximity of the UPRR crossing to the KCS crossing needs to be treated as one crossing.



Figure 3.9 – Sheet Index Map of Alternatives Evaluated in Appendix





Further to the east on the KCS line is the Vidor siding. Operational consideration could be given to extending the second mainline track to points further east, such as to (or potentially past) the Vidor siding. It should be noted that the Vidor siding track is to the south of the existing mainline track, while the proposed track is on the north side of the existing track.

Any new alignment east of the Neches River and north of the existing KCS tracks will impact the Port of Beaumont's Orange County property. While this part of the Port is currently undeveloped, impacts will be assessed based upon the Port's proposed Master Plan.

The west tie-in is conceived to tie in near the BNSF spur line which occupies the center of Long Avenue. As such, the concept envisions that a new rail corridor providing room for two additional tracks would be acquired. While both sides of Long Avenue could be considered for potential expansion, the north side affords the necessary horizontal clearance between pier supports beneath the US-90 structure over Long Avenue. However, the north side also has an electrical substation located on the northeast corner of Long Avenue and Ewing Street. There are also numerous at-grade crossings to evaluate. Coordination with the BNSF indicated that they found no serious issues with either side of Long Avenue.

The Long Avenue alignment must also cross Martin Luther King Jr. Parkway. The current crossing is at-grade and is equipped with flashers and gates. Martin Luther King Jr. Parkway is six lanes wide and currently carries more than 30,000 vehicles per day. Increased train traffic crossing this roadway may necessitate modifications to the type of warning devices and even a potential grade separation.

Immediately west of Martin Luther King Jr. Parkway is the wye into the BNSF Beaumont Yard. The new track would connect to the run-through track of the BNSF Yard and to provide future double-track service connections. A second track is proposed along with upgrades to the existing track between the BNSF Yard and the existing UPRR-KCS interchange. Along this half-mile long segment, there are seven at-grade crossings.

Overall, the proposed route for a stationary bridge adjacent to IH-10 is approximately 6.0 miles long while the existing route is 5.9 miles long. The operating speeds and lengths along the proposed routes become input to the RTC model and its evaluation of operations.

### **Lift Bridge**

When considering a lift bridge, one must acknowledge that a request for a lift at the existing bridge location will likely translate to a similar request for lift at any new location north of the existing lift bridge. This is especially true for recreational/pleasure craft which are likely utilizing the Beaumont Yacht Club immediately north of the IH-10 bridge. Navigation use by industry vessels may be dependent upon any industrial development including the Port of Beaumont's development of its Orange County facilities. The Port's Master Plan identifies the potential for two container-on-barge loading facilities north of the existing KCS bridge. Such docks would require additional bridge lifts which are not currently occurring. Consequently, the best location for a lift bridge may be as close as practical to and immediately north of the existing lift bridge.

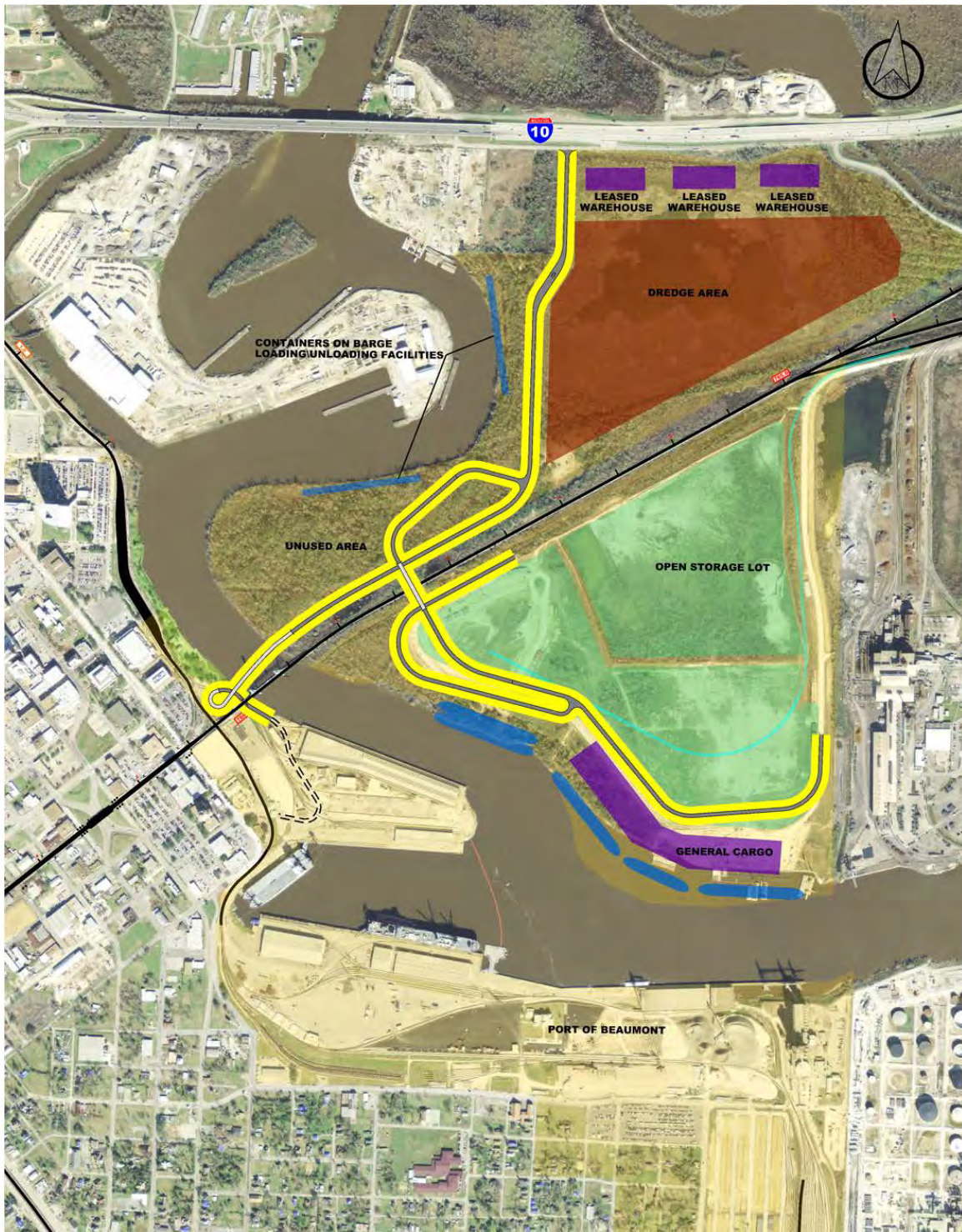
The currently developed parcels of the Port are all located south of the existing KCS river bridge. Current vehicular access from the Jefferson County facilities to the Orange County facilities on the other side of the Neches River necessitates travel north along US-90, then east along IH-10 to Exit 856 continuing east along the Frontage Road to Old US 90 then south across the KCS tracks to George Brown Road crossing the UPRR tracks. All concepts for new alignments being considered (including along the existing river crossing) are located north of the existing river bridge. Consequently to access the new bridges for vehicular use requires crossing the existing KCS tracks on the west side of the river and again on the east side of the river to get to the Port's south parcel.

A potential concept for vehicular traffic to cross on the west side is via a grade separation of the existing KCS rail line that utilizes the current "low water" rail crossing beneath the bridge. Review of as-built plans would suggest that the vertical clearance is sufficient for trucks yet only one direction of travel could be permitted because of lateral clearance. However a second opening of similar dimensions is immediately adjacent and could be used for travel in the opposite direction (southbound). A parcel (currently a surface parking lot) in the northwest quadrant from the existing bridge would be utilized as a loop ramp from the passage beneath the bridge to the surface level of the bridge for vehicular traffic. Access from within the Port to this potential loop ramp would require at-grade crossings of numerous service rail lines. Once crossing the river, the vehicles would be on the north side of the KCS tracks.

A concept to connect the south/north parcels of the Port (separated by the railroad) via a grade separation utilizes a crossing point located approximately half-way between UPRR/KCS junction at Tower 31 and the river bridge. The crossing would be over the KCS tracks at a height of 24 feet clearance plus an assumed six foot depth of structure. The maximum grade for trucks to reach this level is 4% which results in a ramp of approximately 750 feet long. Vehicular access to the Port's Orange County facilities may be best achieved along the IH-10 Frontage Road (assuming that access rights have not previously been acquired). However the western edge of the Port property line is located less than 500 feet west of the physical gore point of the eastbound off ramp which may influence where the best location of an access point could be placed. While access via Old US 90 has some merit to limit potential out-of-distance travel of over a mile to reach an entry west of the eastbound gore, the concept of an at-grade crossing of the KCS tracks is less than desirable for a potentially major facility. The crossing location identified also requires a crossing of other industry track. See Figure 3.10 for a depiction of a roadway circulation concept connecting the Port of Beaumont's Jefferson and Orange County facilities.

The closest existing rail corridor north of the existing river bridge is the Port's Interchange Yard with a connection to BNSF's spur line along Long Avenue. Another rail corridor worth potential consideration is the former Southern Pacific (SP) line which has a direct connection on the west side to the UPRR main line. The SP bridge over the Neches River was a bascule bridge. The former timber supports for the approach spans still remain in Orange County. On the other hand, developments in Downtown Beaumont as well as the Port's Interchange Yard are physical issues that would result in potentially significant impacts.

**Figure 3.10 – Roadway Circulation Concept**  
Connecting Port of Beaumont Jefferson and Orange Counties





A new lift bridge adjacent to the existing lift bridge could be expected to experience vertical clearance issues similar to the “low water” rail crossing beneath the existing bridge. Design options are limited to improving the clearance. Further lowering of the track creates additional constraints with water levels. Raising the track would further restrict the types of rail cars that could pass through. And raising the new bridge to a higher elevation to create additional clearance to solve one issue, would create another issue by interfering with the ability to maintain the existing diamond crossing. While a phased approach might be considered, the clearance at the existing river bridge would remain a constraint until the existing bridge may be replaced. In fact, the Port’s implementation of a new rail access and expanded capacity at Dreyfus Yard are intended to allow for the removal of the Port’s Interchange Yard. With the completion of these improvements, and the redirection of Port traffic, the low water level crossing should become a moot issue.

If one were to consider a lift bridge south of the existing KCS river bridge then a potential location could be along the Port’s eastern edge (adjacent to Gerdeau Ameristeel) and cross the Neches River onto Jefferson County side of the Port of Beaumont connecting into the Dreyfus Yard. By connecting to the Dreyfus Yard, rail system connections could be made into the KCS at the wye north of Chaison Yard. While potentially physically possible, any crossing south of the Port of Beaumont will experience a significant increase in the number of bridge lifts to accommodate navigation traffic. Consequently this concept was dismissed.

When an alignment connects to the existing rail corridor west of the KCS- UPRR split at Tower 31, train movements to either rail corridor are direct. However, this at-grade connection will cause delays at Old US 90 and limit access to the industries and the Port of Beaumont due to trains waiting to cross the bridge. The horizontal alignment is conceived to be parallel to the existing track and again this study assumes a proposed second track associated with the GCHSR initiative. Consequently this alignment’s new track should be considered a third track with the second track extending eastward along the KCS line to Vidor. To accomplish a grade separation, bringing Old US 90 over the KCS tracks would appear to be a logical opportunity.

Again any new alignment east of the Neches River and north of the existing KCS tracks will impact the Port of Beaumont’s Orange County property. This time the lift bridge river crossing location and approach alignment bisects the Port property and creates difficulties for access across the railroad tracks and potentially creating useless remnants of land of reasonable size. While this part of the Port is currently undeveloped, impacts will be assessed based upon the Port’s proposed Master Plan.

The west tie-in is conceived to tie in near the Elizabeth Street turn of the BNSF spur line along Long Avenue. Improvements for operating speed and future double track push the alignment east of the existing BNSF track close to the edge of Brake’s Bayou and likely will require a retaining wall along the west bank of the bayou. Similar issues as already described along Long Avenue and the south connection on the BNSF line to UPRR would remain with an equivalent number of crossings and potentially a few more associated with Pine Street unless Pine Street is closed to through traffic as conceived and shown in the Appendix exhibits.

This proposed route for the lift bridge is approximately 6.3 miles long while the existing route is 5.9 miles long. Again, the operating speeds and lengths along the proposed routes become input to the RTC model and its evaluation of operations.

An alternate alignment could move the new river crossing a bit further south and utilize the former SP corridor. While much of the former SP corridor remains intact, the eastern edge close to the Neches River within the study area is densely developed and is designated a Historic District. This presents a challenge in finding an alignment that does not have significant property or other direct impacts. The alignment concept would require the new rail to be elevated over the BNSF track which in turn provides a higher vertical clearance for the river span when in the closed position. Nonetheless, the number of lifts is estimated to remain the same as the minimum requested clearance (based upon sample data) for the existing lift bridge was a 30 foot lift. The alignment would then remain elevated on structure and traverse through Downtown over several streets including the one-way couplet of US-90, Martin Luther King Jr. Parkway and the BNSF line before beginning descending to meet existing track. A grade separation would also be envisioned at 4<sup>th</sup> Street and dependent upon tie-in locations, a widened grade separation may also be needed at 11<sup>th</sup> Street.

#### ***Summary of Alternatives Considered, Screened and to be Evaluated***

A “long list” of options were considered and screened. Concepts of high-level structures (with a vertical clearance of 150 feet) were considered but found to be both physically and financially impractical. Concepts for a lift bridge located south of the existing KCS bridge would have significant impacts on river navigation and the increase in the number of lifts would adversely affect rail operations. And while consideration of a former rail corridor is philosophically often a reasonable approach, the former SP alignment through Downtown Beaumont is heavily developed with numerous street crossings. Creating an elevated rail corridor through Downtown Beaumont would have significant property and visual impacts. Figure 3.11a depicts the broad corridors of these concepts considered and screened. Figure 3.11b depicts the broad corridors of the concepts to be evaluated in the next chapter.

Design aspects to accommodate the GCHSR are also considered and attempt to follow the guidance provided in the August 2004 plan and profile sheets at a 1” equals 3000’ scale through Beaumont. Those plans include, as part of a Phase 2 component of the GCHSR study, a proposed rail line along the existing UPRR-KCS rail corridor on the north side of the existing rail alignment. This concept is directly reflected by illustrating a third main west of the GCL junction through UPRR’s east yard and continuing further westward to the directional running split. In Orange County, a proposed rail line is also shown along the existing UPRR-KCS rail corridor on the north side of the existing rail alignment. Placing a second UPRR track on the north side of the existing rail requires a crossing of the KCS rail. Placing the second UPRR track on the south side might eliminate the need for a crossing yet with the extensive existing right-of-way width on the north side between the Neches River bridge and the KCS-UPRR split at Tower 31, design options were considered to accommodate a crossing with proposed rail on the north side.

Figure 3.11a – Concepts Considered

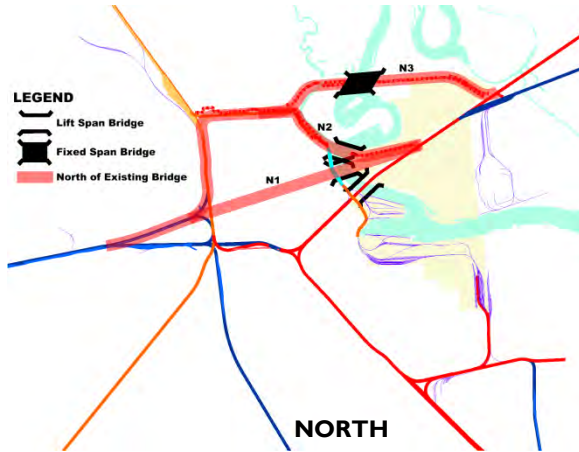
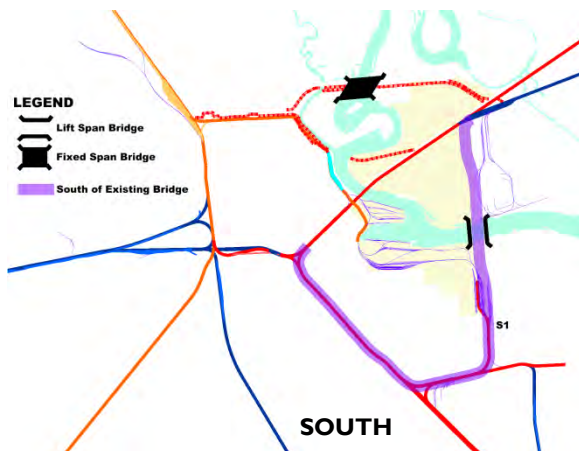
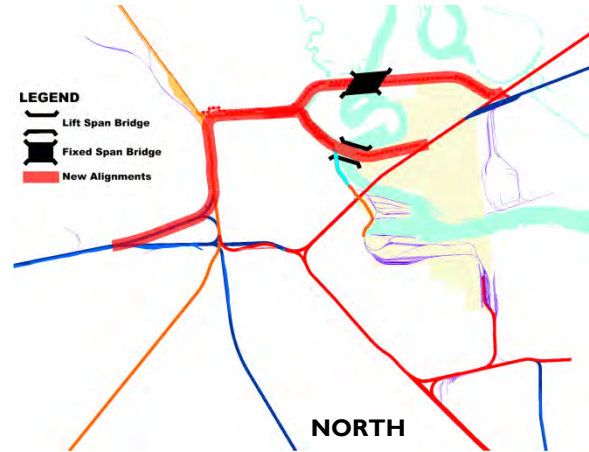


Figure 3.11b – Concepts to be Evaluated





In order to provide a level at-grade rail crossing, the new rail alignment should cross at a tangent and then begin its horizontal curvature. This geometric design may necessitate minor additional right-of-way acquisition. Another option could be grade separation, though obviously this has cost implications. An assessment of an appropriate design can be determined when more information on potential future operations is available. Considerations may even need to be given to the potential for double track alignments coming together along both the UPRR and the KCS routes at the KCS-UPRR split at Tower 31.

Three build alternatives are evaluated in more detail and include:

- Existing Alignment
  - North side of KCS tracks (lift span bridge)
- New Alignments
  - Interstate 10 alignment (fixed span bridge)
  - Pine Street alignment (lift span bridge)

### **RTC model assumptions**

For the alternatives with new railroad alignments, the RTC model assesses an initial single-track configuration with centralized traffic control. Physical planning allows for expansion to double-track configuration though that concept does not affect operations. Maximum permitted speeds are assigned to the various rail segments based upon initial horizontal and vertical curvature as well as existing of adjacent operating speeds. The model is coded in such a way that the new alignment (whichever one is being tested) is preferred, but train traffic will be assigned to the existing route if it minimizes congestion delay. The modified bridge openings for future conditions (16 lifts per week) are retained on the existing railroad route in all alternative simulations, so that the bridge times are a constant, not an independent variable that would skew results.

With the alternate of the double track crossing of the existing route, a second track is simply added in the model to the KCS line relatively independent of physical design elements. Due to the close proximity of the two bridges, it was assumed that any call to lift the bridge for maritime traffic would require the new lift bridge to operate at the same time as the existing lift bridge.

Initially, the alternative alignments previously described in this chapter were screened utilizing existing train traffic volumes. The IH-10 alignment and the Pine Street alignments utilize some common segments including the North-South corridor and the Long Avenue corridor (both currently operated by BNSF). For location of these segments see Sheet Index Maps 6 and 7 respectively. The initial RTC model runs discovered that the North-South corridor was forecasted to experience a significant increase in delays as an existing single-track operation. Consequently, additional RTC model runs with projected train traffic were modified to include a double-track operation. The RTC model does not specifically include the existing BNSF Long Avenue rail as part of its network, although train traffic is accounted for in the model. And since the design concept is to construct a separate new track adjacent to Long Avenue, the only modification was to add the proposed track as part of the RTC model run.

For the IH-10 alignment, a significant operational modification included the railroad grade separation at the KCS-UPRR split at Tower 31 on the east side of the Neches River. Initial design thoughts were to physically tie into the existing rail corridors as quickly as possible in order to minimize construction costs and probable impacts. However the navigation vertical clearance and minimum desirable grades physically required additional horizontal length for the profile to transition over the Neches River before return to existing ground and the existing rail routes. On the east side of the Neches River, this resulted in the new alignment creating a split where one rail tied into the KCS towards DeQuincy while another rail was grade separated over the KCS line before tying into the UPRR towards Connell. This rail grade separation resulted in operational improvements on the east side of the Neches River that was not evident in the alternative without this rail grade separation.

Due to the project scope addressing only the Neches River area, the model assumptions change only the RTC's model rail infrastructure or network within the Beaumont area. Other potential improvements discussed in prior studies, such as the Texas Rail Plan, specifically those in and around the Houston area which would have a direct and positive effect upon operations east of Houston towards Beaumont are not included in the rail network for this study.

## 4.0 Evaluation of Alternatives

The different route options are evaluated by means of a selection of performance measures. To organize the evaluation, the framework provided by the Texas Department of Transportation's *Guidebook for Rail Project Prioritization* (May 2012) was consulted. As this is a rail capacity/facility improvement project, the measures used focus on the Transportation impacts, e.g., congestion relief and system capacity, of the proposed infrastructure changes. While the focus is on transportation impacts, an assessment is also made of an alternative's performance in the areas of Sustainability, e.g., environmental / social, and Implementation, e.g., project development, as data and known conditions permit.

Three alternative crossings of the Neches River are to be evaluated. These include an alignment along the existing river crossing corridor as well as new alignment alternatives with different types of river bridge crossings; stationary or lift span. Essentially these were determined to be the best of the options considered for alignment location and bridge type. The three alternatives are:

- Add capacity adjacent to existing KCS alignment with new lift bridge, as shown in Figure 4.1
- Add capacity on new alignment adjacent to Interstate-10 with stationary bridge, as shown in Figure 4.2a, and
- Add capacity on new alignment along Pine Street corridor with new lift bridge, as shown in Figure 4.2b

**Figure 4.1 – Existing Alignment Evaluated  
(New lift bridge adjacent to existing)**

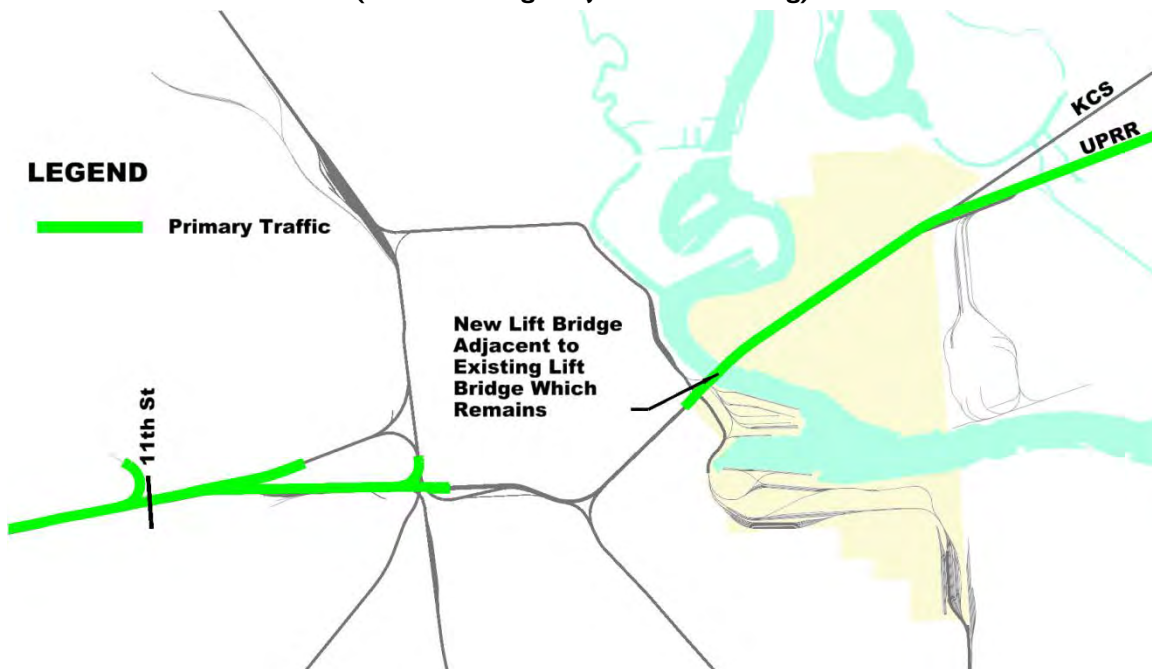




Figure 4.2a – New Alignment Evaluated (IH-I0 Fixed bridge)

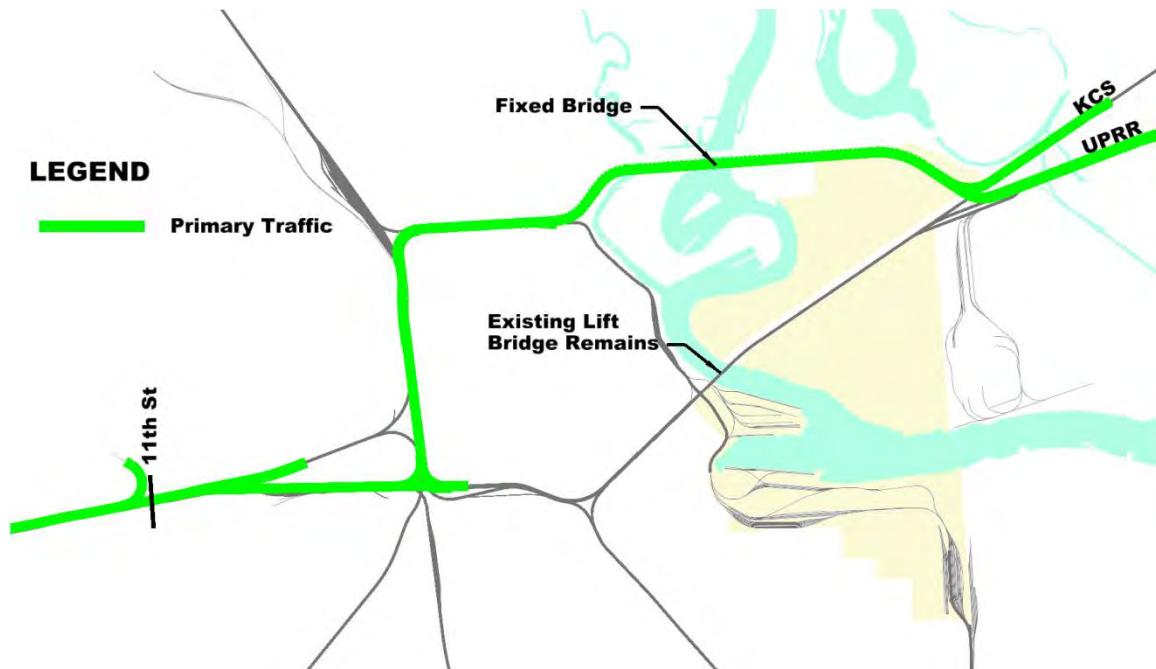


Figure 4.2b – New Alignment Evaluated (Pine Street Lift bridge)



## Evaluation Measures

The measures used in the evaluation are discussed below. The performance of rail system given the assumptions underlying each alternative was estimated using Rail Traffic Controller (RTC, Berkeley Simulation Software) and GradeDec.net (Federal Railroad Administration). Each alternative will generate a set of performance measurements for the overall network. These results will be compared to the projected base case, i.e., the Project No-Build. Results may also be reported for the individual railroads (though at an aggregate level) to assess whether impact vary by carrier from a given alternative.

## Transportation

The evaluation of transportation impacts includes a review of river, rail, and highway operations. The rail operations are based upon the output from the RTC model while highway operations focus upon the output from GradeDec.net for the at-grade rail-highway crossings along the corridor being evaluated. River impacts are discussed based upon the degree of obstruction to navigation traffic.

### *Rail Operations*

All alternatives offer the option to route trains via either the existing rail lines or the alternate route, depending upon circumstances. In effect when combined, the existing route and proposed alignments create at least two main tracks, and to some extent three, between the UPRR Beaumont Yard and the KCS-UPRR split at Tower 31. This added capacity offers more flexibility than just the existing route alone.

The rail operations measures developed by RTC include total system train miles, total system weekly trains and total system weekly train delay. While 582 trains are dispatched, not all trains complete their runs within the week long measurement window. Delays accumulate over the week and some trains are behind the measurement window at the time it expires. The evaluation of an improved river crossing to provide double track capacity along either the existing route or a new location, as presented in Table 4.1, shows a significant reduction compared to the “no-build” condition (on the order of a factor of three to four). However in comparison to existing conditions this represents an increase in delay by a factor of two or more. Train traffic has also doubled and the delay hours per day may not be unrealistic when considering the Beaumont area as limited distance of a slow-speed terminal with the existing bridge as a bottleneck.

**Table 4.1  
RTC Freight Train Performance – Alternatives with 2035 projected volumes**

<b>Projected 2035 Case</b>	<b>Train Count</b>	<b>Delay Hours / Day</b>	<b>Delay Minutes/100 Train-Miles</b>	<b>Bridge Lifts per Week</b>	<b># tracks crossing Neches River</b>
"no-build"	582	69.7	306.4	16	1
double track existing route	573	23.4	158.1	16	2
IH-10 new alignment alternative	573	17.3	113.9	16	2

The IH-10 rail alignment alternative, as a fixed bridge, attracts approximately 37% of the total weekly train traffic. However, this represents nearly half of what could be classified as “through” train traffic crossing the Neches River. This amount of rerouting of trains is an indication that the existing rail corridor has a sizeable degree of local service that crosses the Neches River, including trains accessing the Port of Beaumont. While the new alignment option represents an overall operational improvement compared to the double tracking of the existing alignment, all of the options are more congested than current conditions. Comparing the new alignment between existing and projected train volumes, it becomes obvious that the increase in train traffic has the most significant effect upon operations.

### ***River Navigation Impacts***

River navigation impacts address the potential to affect the movement of water borne vessels. The concept of additional capacity with a second lift span river bridge adjacent to the existing bridge should not adversely affect river navigation. One central clearinghouse for raising the lift bridge(s) would remain. However, since the two structures would be aging at different rates, the older structure may experience more malfunctions and require more maintenance. The concept of a second lift bridge only 0.3 nautical miles north of the existing bridge, such as shown with the Pine Street alignment, will require both bridges to be in the open position to accommodate river traffic and could potentially increase rail delays. The fixed span rail bridge concept adjacent to the IH-10 alignment at the same vertical clearance afforded by the IH-10 structure would not have any impacts to river navigation, yet the existing lift bridge would still remain.

### ***Key At-Grade Crossings***

An assessment of critical at-grade crossings for grade separation was conducted utilizing the GradeDec.net software. The software package includes the base condition (type of crossing control) with alternate improvements in a hierarchical manner from passive control to lights, to gates, to new technology to grade separation or closure. A benefit – cost ratio is then determined based upon inputted train volumes, growth rates (both for rail and road) as well as estimated costs for improvements. To conduct the assessment, the input was entered using the base information developed by the RTC runs used for this analysis for the new and existing track configurations. A grade separation concept was developed for the segments analyzed along with an opinion of probable costs. The evaluation can help determine if a grade separation is beneficial.

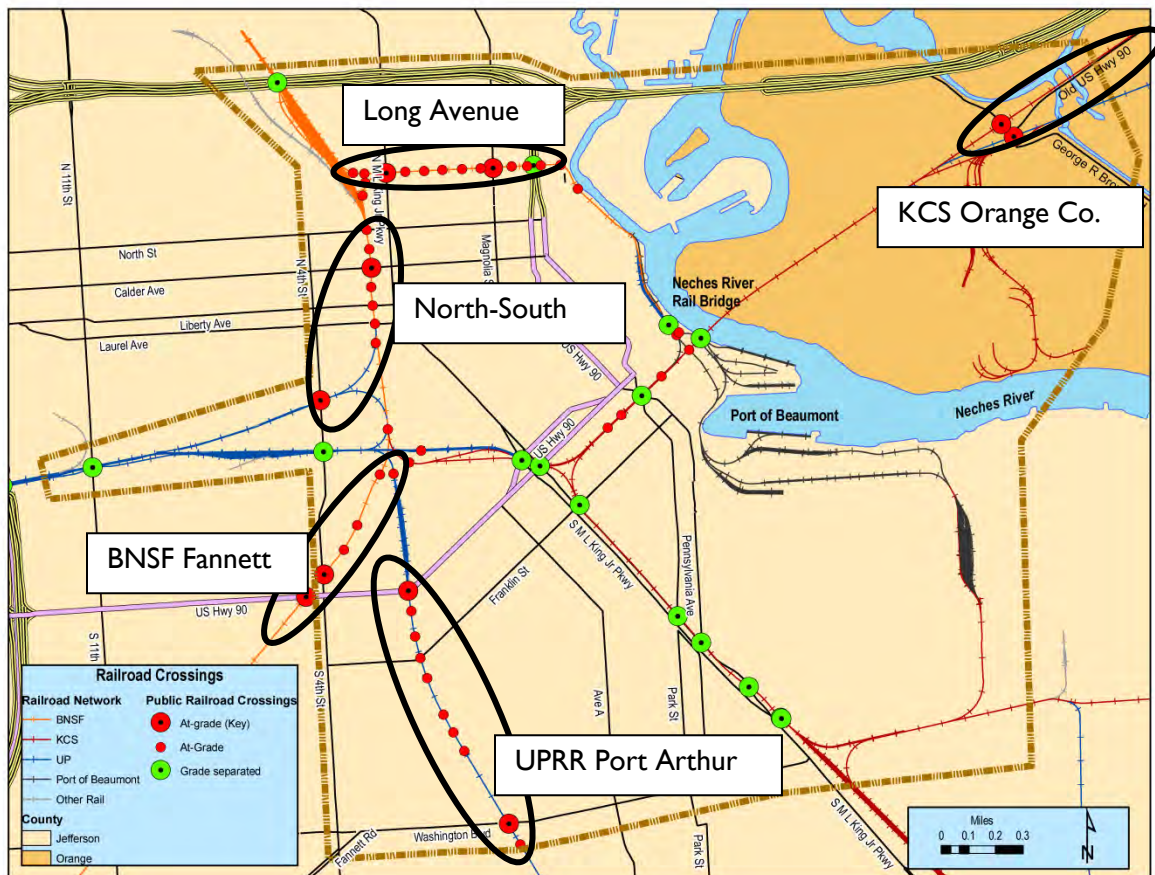
The five rail segments for assessment via GradeDec.net and are shown in Figure 4.3. These segments were selected as representing corridors with both heavily trafficked vehicular and railroad at-grade crossings based upon projected conditions and their options. Information on these critical crossings and others along the corridors being evaluated is provided in the Appendix.

Three of the five rail segments are essentially evaluated under future conditions (increased train and vehicular volumes) and include:

- BNSF Gulf Silsbee MP 62.9 towards Fannett
- UPRR Lafayette branch Sabine towards Port Arthur, and
- KCS/UPRR in Orange County



**Figure 4.3 – Crossing Corridors  
(Key at-grade crossings evaluated for grade separation)**



The remaining two rail segments have the potential to be directly affected by the alternate alignments under consideration. These include:

- Long Avenue and
- North-South segment (supplemented with 4<sup>th</sup> Street)

The BNSF Gulf Silsbee segment is assessed from milepost (MP) 74.58 – Washington Blvd. to 76.29 Crockett St., a distance of less than two miles. A total of ten crossings are included in this segment of the BNSF corridor. Grade separations were considered at US-90 (College) and immediately adjacent at 4<sup>th</sup> Street. Because of the proximity to each other and the major signalized intersection of College and 4<sup>th</sup> Streets, the grade separations must be viewed together and not separately. The construction costs are estimated in excess of \$18 million. Right-of-way costs associated with the surrounding commercial properties may be in excess of \$6 million. The overall benefit/cost ratio is significantly less than 1 at 0.229. The major source of benefits (38%) is from travel time savings.

The UPRR branch towards Port Arthur is assessed from milepost (MP) 28.35 – Euclid Ave. to 29.98 Crockett St. a distance of approximately 1.5 miles. A total of eleven crossings are included in the

corridor. Grade separations were considered at Washington Blvd. and at US-90 (College). These crossings are nearly one mile apart from each other. The construction costs are estimated on the order of \$9 million for each crossing. Right-of-way costs could range from \$1 to \$3 million. The overall benefit/cost ratio is significantly less than 1 at 0.299. The major source of benefits (54%) is from travel time savings and is associated with US-90 and its higher level of traffic volume.

The KCS Orange County segment is assessed from milepost (MP) 761.03 – N Dewitt St. to 764.61 Old US-90 a distance of more than 3.5 miles. A total of five crossings are included in the corridor. A grade separation was considered at Old US-90. This crossing is physically very close to the UPRR track as well as the access road (George Brown Drive) leading to the Port of Beaumont. The construction cost is estimated on the order of \$11 million for the grade separation of both crossings. Right-of-way costs could reach up to \$2 million. The overall benefit/cost ratio is significantly less than 1 at 0.241. The major source of benefits (67%) is from safety benefits. The analysis as conducted only considers the Old US 90 crossing for potential benefits.

The Long Avenue segment is assessed for a distance of approximately 2/3<sup>rd</sup> of a mile. The existing track is operated by BNSF and is located in the middle of the roadway. A total of ten crossings are included in the corridor under evaluation. Several scenarios could be considered, ranging from a “no-build” scenario to the alternative alignment adjacent to the existing rail line. The concept for rail operations within this corridor would leave the existing BNSF track as is for service to the port and a new alignment would accommodate “through” movements and cross the river near IH-10. Currently only two trains per day utilize the existing track. An estimate of as many as 16 trains per day could be diverted to the new alignment under existing train volume conditions on “opening day” based on RTC simulations. Growth in future years is forecasted to 32 trains per day. Grade separations were considered at MLK Jr. Parkway and at Magnolia Street within the corridor limits. These crossings are nearly 0.4 miles apart from each other. The construction costs are estimated in excess of \$13 million and \$9 million respectively. Combined right-of-way costs approach \$1 million. The overall benefit/cost ratio is 0.863 based upon an initial 16 trains per day. The major source of benefits (78%) is from vehicular travel time savings. The overall benefit/cost ratio increases to more than 1 at 1.596 based upon the future 32 trains per day. The major source of benefits (85%) is from travel time savings. While not specifically evaluated, the “no-build” scenario with just the existing service track would result in a benefit/cost ratio less than 1.0.

The North-South segment is assessed for a distance of approximately 3/4 of a mile. The existing crossings include three different sets of milepost designations. A total of eight crossings are included in the corridor under evaluation. Again, several scenarios could be considered, ranging from a “no-build” scenario to the alternative alignment adjacent to the existing rail line. The concept for rail operations would leave the existing BNSF track as is for service use and a new alignment would accommodate “through” movements. Currently as many as six trains per day utilize the track. An estimate of as many as 16 trains per day could be diverted to the new alignment under existing train volumes resulting in a total of 22 trains per day estimated in the Base Case RTC model. Grade separations were considered at Calder Ave. and at 4<sup>th</sup> Street. These crossings are nearly 0.6 miles apart from each other. The construction costs are estimated at approximately \$9 million each. Combined right-of-way costs approach \$1.2 million. The overall benefit/cost ratio is significantly less than 1 at 0.240 based upon an

initial six trains per day. The major source of benefits (49%) is from travel time savings. The overall benefit/cost ratio increases to close 1 at 0.805 based upon the new alignment diversion with a total of 22 trains per day. The major source of benefits (78%) is from travel time savings.

**Table 4.2  
Highway and Railroad Crossing Evaluations**

	BN Fannett	UP Port Arthur	Long Avenue		North-South corridor		KCS Orange Co.
			New (16)	New (32)	Existing	Alternate	
Safety Benefits (\$1,000)	\$ 972	\$ 816	\$ 957	\$ 1,083	\$ 582	\$ 828	\$ 1,145
Travel Time Savings (\$1,000)	\$ 1,493	\$ 2,792	\$ 10,888	\$ 21,775	\$ 1,921	\$ 10,242	\$ 18
Environmental Benefits (\$1,000)	\$ 7	\$ 14	\$ 51	\$ 101	\$ 8	\$ 46	\$ -
Veh Operating Cost Benefit (\$1,000)	\$ 117	\$ 216	\$ 714	\$ 1,428	\$ 118	\$ 630	\$ 1
Network Benefits (\$1,000)	\$ 9	\$ 16	\$ 46	\$ 93	\$ 13	\$ 66	\$ -
<b>TOTAL BENEFITS (\$1,000)</b>	<b>\$ 3,918</b>	<b>\$ 5,193</b>	<b>\$ 13,903</b>	<b>\$ 25,719</b>	<b>\$ 3,905</b>	<b>\$ 13,080</b>	<b>\$ 1,703</b>
<b>TOTAL COSTS (\$1,000)</b>	<b>\$ 17,145</b>	<b>\$ 17,393</b>	<b>\$ 16,116</b>	<b>\$ 16,116</b>	<b>\$ 16,242</b>	<b>\$ 16,242</b>	<b>\$ 7,802</b>
Net Benefits (\$1,000)	\$ (13,227)	\$ (12,200)	\$ (2,213)	\$ 9,603	\$ (12,336)	\$ (3,162)	\$ (5,378)
Benefit Cost Ratio	0.229	0.299	0.863	1.596	0.240	0.805	0.241

In summary, of the five segments analyzed for grade separation, only the Long Avenue corridor has a positive benefit cost ratio and that is only with increased and diverted train traffic associated with the new rail alignment alternative adjacent to IH-10. The existing low volume service line today would not reach a level to suggest the need for a grade separation. If a new rail alignment alternative is pursued, additional benefits could be investigated with the potential closure of one or more local streets' at-grade crossing along Long Avenue.

## **Sustainability**

The evaluation of sustainability impacts includes a review of potential environmental and social impacts. Elements from the transportation and implementation impacts cross over to provide additional input on such factors as property impacts and transportation which have an effect upon air quality and energy use.

### **Property Impacts**

Right of way acquisition includes right of way impacts created by new railroad construction and any associated roadway improvements, such as grade separations. Four quantitative measures are utilized based on information available in the Jefferson and Orange County Assessor's files and interpretation of aerial photography. These quantitative measures are: Number of Parcels which quantify the parcels that might be impacted, the total area of those parcels, and the area that might be most directly impacted or acquired, and Parcel Ownership which indicates an interpretation of ownership for each parcel based upon the name associated with the parcel in the Assessor's File. Another factor is the land use which was determined through a review of aerial photography. Parcels were categorized as being residential, commercial / industrial, open space / vacant, or other.

The number of properties impacted was determined by combining parcels with a common account number in the Assessor's file. Note however, that not all parcels in the file had account numbers. Assessed value for Jefferson County parcels was estimated by summing the land and improvement value

for each identified property. As was the case with the account numbers, not every property had land or improvement values. This assessed value should not be interpreted as representing probable costs to acquire the right of way as it is not a reflection of market value, does not include any relocation assistance, and values were not available for all parcels potentially impacted. Nonetheless it allows for a relative comparison. Table 4.3 summarizes the results of the analysis of potential right-of-way impacts. The Appendix contains a series of maps that illustrate the parcels potentially impacted by each alignment, the assumed ownership of each parcel, and the land use for each parcel.

**Table 4.3 – Potential Property Impacts**

ROW Impacts	Alternatives					
	Existing Alignment		New Alignments			
			IH-10 Fixed Bridge		Pine Street Lift Bridge	
	Jefferson Co.	Orange Co.	Jefferson Co.	Orange Co.	Jefferson Co.	Orange Co.
<b>Parcels</b>						
Number	59	1	76	6	85	2
Area (acres)	17	54	48	745	22	268
Acres Impacted	10	9	15	16	9	4
<b>Parcel - Ownership</b>						
Private	14	0	69	2	71	0
Railroad	1	1	0	2	2	1
Utility	0	0	2	0	3	0
Government	27	0	3	1	6	1
Institutional	10	0	2	0	2	0
Unknown	7	0	0	0	1	0
<b>Land Use</b>						
Residential	0	0	15	0	15	0
Commercial / Industrial	17	0	29	1	22	0
Open Space / Vacant	16	0	29	3	45	1
Other	26	1	3	2	3	1
<b>Properties</b>						
Number	18	1	52	6	56	2
Total Assessed Value	\$1,270,000	N/A	\$1,570,000	\$4,870	\$2,180,000	\$938

Table Note: Not all parcels had a value associated with them. Total Assessed Value includes only parcels where a valuation was available and adjusts the value for parcels that may only be partially impacted.

### Potential Environmental Impacts

The potential for environmental impact is driven by construction activities associated with the implementation of an alternative's infrastructure. The focus is upon key environmental issues and impacts as well as the complexity of permits. Several of the attributes described under the existing conditions such as population, households, income, race and employment are represented by the surrogate of property impacts by land use categories. Residential impacts would affect population and



households, while commercial and industrial impacts would affect employment and income. Impacts to water resources including wetlands and floodplains are indicated by assumed areas of potential right-of-way. Often these natural areas are habitat and consequently serve as a surrogate for threatened and endangered species. For a list of threatened and endangered species for Jefferson and Orange counties from the Texas Parks and Wildlife Department, see the Appendix. Specific sites that could be affected are identified for archeological, historic and community facilities including public lands and parks. Impacts to these attributes are represented by four degrees of impact ranging from no impact to low impact to medium impact to high impact. The degree of impact is neither based upon an absolute value nor is it relative to the other alternatives. A summary of potential environmental impacts is shown at the end of this section in Table 4.4.

**Superfund Site** - Superfund is the name given to the environmental program established to address abandoned hazardous waste sites. It is also the name of the fund established by the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended. This law was enacted in the wake of the discovery of toxic waste dumps such as Love Canal and Times Beach in the 1970s. It allows the EPA to clean up such sites and to compel responsible parties to perform cleanups or reimburse the government for EPA-lead cleanups. There is one Superfund site within the Study Area. The name of the site is International Creosoting located at 1110 Pine Street, Beaumont, Jefferson County. The new IH-10 alignment runs through the middle of this site. This site is listed as number 11 out of 25 on the State of Texas Superfund registry that identifies those facilities that have been determined to pose an imminent and substantial endangerment. The Registry, along with a background and history of the International Creosoting site, appear in the Appendix.

**Ecologically Significant Stream Segment** - As a result of the passage of Texas Senate Bill 1 (SB1) in 1997, water planning in Texas became the domain of regional planning groups rather than the Texas Water Development Board (TWDB). As a part of the planning process, each regional planning group may include recommendations for the designation of ecologically unique river and stream segments in their adopted regional water plan. Stream segment designation is to be supported by a recommendation package that includes a physical description, maps, photographs, literature citations, and data pertaining to each candidate stream segment.

The Neches River is an Ecologically Significant Steam Segment from the confluence with the Sabine Lake in Orange County upstream to Town Bluff Dam in Jasper/Tyler County. Documentation available from the State of Texas Parks and Wildlife Department describes this stream segment as follows:

- Biological function - extensive freshwater wetland habitat displays significant overall habitat value<sup>27</sup>
- Riparian conservation area - Big Thicket National Preserve; Lower Neches River Wildlife Management Area ; Part of the Great Texas Coastal Birding Trail
- High water quality/exceptional aquatic life/high aesthetic value - exceptional aesthetic value<sup>28</sup>
- Threatened or endangered species/unique communities - unique, exemplary, and unusually extensive natural community (NPS, 1995); Paddlefish (SOC/St.T) (TPWD, 1998) ; The most abundant and diverse unionid assemblage found to date in Texas; largest known population of

sandbank pocketbook freshwater mussels in Texas; one of the two largest populations of rare, endemic Texas heelsplitter freshwater mussels remaining<sup>29</sup>

**Emergent Wetland** – According to the USGS, the Emergent Wetland Class is characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. All water regimes are included except subtidal and irregularly exposed. In areas with relatively stable climatic conditions, Emergent Wetlands maintain the same appearance year after year. In other areas, such as the prairies of the central United States, violent climatic fluctuations cause them to revert to an open water phase in some years (Stewart and Kantrud 1972). Emergent Wetlands are found throughout the United States and occur in all Systems except the Marine. Emergent Wetlands are known by many names, including marsh, meadow, fen, prairie pothole, and slough.

**Forested / Shrub Wetland** – According to the USGS, the Class Forested Wetland is characterized by woody vegetation that is 6 m tall or taller. All water regimes are included except subtidal. Forested Wetlands are most common in the eastern United States and in those sections of the West where moisture is relatively abundant, particularly along rivers and in the mountains. They occur only in the Palustrine and Estuarine Systems and normally possess an overstory of trees, an understory of young trees or shrubs, and an herbaceous layer.

**Table 4.4 – Potential Environmental Impacts**

Environmental Challenge	Alternatives		
	Existing Alignment	New Alignments	
		IH-10 Fixed Bridge	Pine St. Lift Bridge
Superfund Site		Yes	
Ecologically Significant Stream Segment	Yes	Yes	Yes
Freshwater Emergent Wetland		Yes	
Freshwater Forested /Shrub Wetland		Yes	Yes
FEMA Q3 Zone A (100 Year)	Yes	Yes	Yes

## **Implementation**

The evaluation of implementation impacts includes a review of probable construction costs as part of a cost effectiveness assessment. Property impact costs, while not specifically estimated at this time, are discussed in broader terms as an influence upon project development.

### **Probable Construction Costs**

The construction costs for the alignment concepts have been developed based upon major elements such as the river crossing bridge as well as the length of structural approach spans. These approach spans can be very long considering the potential height of the proposed rail, topography, and local soil conditions. For alignment comparisons, the quantity and associated costs of the rail were estimated

based upon new rail alignment and existing rail alignment. The existing rail alignments also considered whether the proposed track was within the existing rail right-of-way or adjacent to but outside existing rail right-of-way. The costs of track was varied depending upon upgrade of existing track, new track on-grade, new track on fill (typically up to 16 feet), new track on structure, and new track on river bridge. Only one of the two potential tracks is initially proposed for new track on structure and the river bridge. In order to be consistent with the structural availability for a second track, the earthwork for the future second track is included. If necessary, new rail sidings and connections are quantified. At this stage, the rail traffic control and signaling system as well as improvements to crossing warning devices at highways are included in the contingencies. Later on as roadway modifications (if necessary) are defined, separate line items may be included.

The costs shown in Table 4.5 only account for construction activities in today's 2012 dollars. The costs do not include right-of-way acquisition, design, permitting or construction inspection costs, or any annual maintenance costs. The potential for such costs should be considered when comparing alignments, particularly on those alignments that have significant property impacts. For comparative purposes, a summary of assessed values for potentially affected properties is provided and discussed in the sustainability section.

It is worth noting that when planning for a double track structure yet only initially constructing one of the two tracks, additional up-front costs are incurred to build a structure capable of supporting the second track. Consequently, alternatives with lengthy bridge structures include costs for initial construction but also future expansion. The new alignment adjacent to Interstate 10, which is primarily structure along its entire length, has initial costs to accommodate future expansion that are greater than the costs to install future track.

**Table 4.5 – Probable Construction Costs**  
Including contingencies in 2012 \$ millions

Segment	Existing Alignment	New Alignment	
	Lift Bridge	IH-10 Fixed Bridge	Pine Street Lift Bridge
Orange County	\$ 40		\$ 35
Neches River bridge	\$ 40	\$ 185	\$ 80
Long Avenue	\$ -	\$ 5	\$ 5
BNSF Connection	\$ -	\$ 10	\$ 10
UPRR 3rd Main	\$ 40	\$ 40	\$ 40
<b>TOTAL</b>	<b>\$ 120</b>	<b>\$ 240</b>	<b>\$ 170</b>

## **Benefits**

The projected conditions provide a means to assess potential future operations under an assumed growth scenario. Operational analysis indicates that current train volumes would benefit from a second track along the current river crossing. A no-action alternative would result in significant congestion. When reviewing the forecasted train volumes with additional track across the Neches River, delays are reduced by half when compared to a single track (existing physical conditions) scenario. In addition, as modeled through RTC, the lift bridge operations result in some delays, however that level is relatively minor. Future growth will demand a second track across the Neches River.

The IH-10 alignment with its fixed bridge has greater overall benefits than a second track on the existing lift bridge alignment. However review of where the benefits accrue indicates that the grade separation at the KCS-UPRR split at Tower 31 results in a significant portion of those reduced delays.

## **Summary of Alternatives**

Four alternatives have been assessed under forecasted conditions. The projected “no-build” alternative attempts to establish a baseline for comparison. This alternative establishes the fact that Beaumont’s rail network would benefit from an additional river crossing. In addition to the “no-build” alternative, three “build” alternatives were evaluated that involved improving capacity by providing additional track as well as exploring operational issues associated with the lift bridge over the Neches River. The three alternatives concentrated on improving the existing rail route with a new adjacent lift bridge, a new rail alignment also with a lift bridge near the existing rail corridor, and a new rail alignment with a fixed river bridge crossing north of the existing rail corridor. A brief summary of the pros and cons of each build alternative are provided.

### Expand existing route to double track river crossing (lift bridge)

This keeps the existing bridge in place and assumes it to be operational with a projected 16 lifts per week in the future case. In addition, a second lift bridge is considered immediately adjacent and north of the existing structure. While the RTC model’s performance measures with the double track conditions improve over the “no-build” conditions, the delays under the projected train volumes are greater than under the ‘base case’. This alignment alternative does not intrinsically address the delays associated with the KCS-UPRR split at Tower 31. As the proposed improvements remain adjacent to or within the existing rail corridors, impacts to the community are minimized. Infrastructure costs only for this improvement in the Beaumont area are estimated in 2012 construction dollars approach \$120 million.

### New Pine Street alignment (lift bridge over Neches River)

This keeps the existing bridge in place and assumes it to be operational with a projected 16 lifts per week. The Pine Street alignment was initially tested through the RTC model with a potential fixed river bridge crossing. However physical limitations determined that the only practical fixed river bridge crossing lies immediately adjacent to the IH-10 corridor. Consequently it was determined that the Pine Street alignment would be analyzed with a lift bridge. Nonetheless, that new lift bridge location created its own set of design issues that result in additional costs compared to constructing an adjacent rail bridge to the existing rail’s river crossing. The alignment’s tie in on the west side is likely to create significant adverse impacts to a neighborhood with property acquisition as well as impacts to vehicular operations at critical at-grade crossings that will only add to the probable construction costs. This



alignment alternative does not intrinsically address the delays associated with the KCS-UPRR split at Tower 31. Costs for this alignment are estimated in 2012 construction dollars approach \$170 million.

New IH-10 alignment (fixed bridge over Neches River)

This keeps the existing bridge in place and assumes it to be operational with a projected 16 lifts per week. The new IH-10 rail alignment has potentially significant operational benefits by addressing two key issues, the delays associated with the lift operations of the river crossings as well as the grade separation of the KCS-UPRR split at Tower 31 on the east side of the Neches River. However, the alignment tie in on the west side is likely to create significant adverse impacts to a neighborhood with property acquisition as well as impacts to vehicular operations at critical crossings that will only add to the probable construction costs. This alignment is located close to an EPA Superfund site. Costs for this alignment are substantial and are estimated in 2012 construction dollars approach \$240 million. While viewed from a railroad operational viewpoint this new alignment is the best within this study area. The overall rail network operations indicate that more systemic improvements outside the Beaumont area are required. The high degree of cost and probable impacts may be offset by any additional operational benefits.

***Funding***

Up to this point in the evaluation of alternatives, the emphasis of the analysis has been on the benefits, costs, and impacts of the different alternatives. Given that the alternatives under consideration are conceptually quite similar, it has been the assumption that the selection of a preferred alternative would not be significantly impacted by an analysis of funding options. Nonetheless, all three railroad companies would need to agree upon a specific solution and its funding which in turn could make public funding sources available. While the determination of potential funding sources for the proposed improvements is beyond the scope of this effort, a cursory review may be beneficial. For example, the presence of the Existing Alignment Alternative within a corridor currently used by Amtrak and that is part of the proposed Gulf Coast High Speed Rail project may make it eligible for funding programs that the other alternatives are not.

Funding mechanisms such as tolls, user's fees based on cars and/or weight, or the creative use of public / private partnerships would seem to be options for all the alternatives. The Texas State Rail Plan also presented a summary of Federal and State programs and grants available to Texas to fund improvement projects. This summary is in the Appendix. MAP-21, the Moving Ahead for Progress in the 21<sup>st</sup> Century Act (P.L. 112-141), was signed into law by President Obama on July 6, 2012. Funding surface transportation programs at over \$105 billion for fiscal years (FY) 2013 and 2014, MAP-21 is the first long-term highway authorization enacted since 2005. SAFETEA-LU expired on September 30, 2009 and had ten extensions.

***Summary Matrix***

Utilizing the Transportation, Sustainability and Implementation categories of TxDOT's rail project prioritization framework, this Neches River Bridge Feasibility Study provides an assessment of the three "build" alternatives under consideration. The assessment is preliminary and the values assigned to the various criteria are subject to change with input from TxDOT. The matrix as shown in Table 4.6 offers an overview and a comparison of the potential impacts of the alternatives.

Figure 4.6 – Summary Matrix

Category	Criterion	Measures	Alternatives			Qualitative Assessment
			Existing Alignment (new lift bridge adjacent to existing bridge)	New Alignments		
				IH-10 fixed bridge	Pine St. bridge	
Sustainability	Economic Impact	Jobs	5	7	5	Higher construction cost will create more jobs, though this may be in conflict with program financial resources.
		Train Delay	3	5	3	While overall delays are the least with the fixed bridge option, the projected level of train volumes would result in significant delays throughout the entire rail network.
		Fuel Cost	3	5	3	Fewer delays result in less fuel consumption and therefore less cost, however in absolute terms the increase in delays is significant enough to result in increased fuel costs across the board.
	Environmental / Social Impact	Air Quality	3	5	3	Again, the alternatives can be compared on a relative scale amongst each other. Here the least train delay results in the best air quality and review of at-grade crossings indicates minimal environmental benefits. Under an absolute scale, the overall network performance indicates a significant increase in delay and therefore a reduction in air quality.
		Energy Use	3	5	3	Again, the alternatives can be compared on a relative scale amongst each other. Here the least train delay results in the best energy use and review of at-grade crossings indicates minimal environmental benefits. Under an absolute scale, the overall network performance indicates a significant increase in delay and therefore adverse energy use.
		Environmental	3	7	5	The Interstate 10 alignment may have the most significant environmental impacts. It goes through a Superfund Site, has the second longest crossing of Ecologically Sensitive Stream Segment, and crosses the greatest distance in wetlands/floodplains that may be home to T&E species.
		Social Impacts	3	7	7	Both of the new alignments will likely have the greatest community impacts. Homes, businesses, and churches will need to be acquired for the purposes of ROW. Livability will be reduced as remaining properties will be impacted by increased noise and vibrations from increased train traffic. Right of way will essentially form a barrier between the north and south sides of the neighborhood. Social Justice will likely be a concern as well as the Long Avenue corridor is home to a relatively low income minority population
	Asset Preservation	ROW	5	7	7	Either new alignment will help to preserve the Long Ave ROW. The improve existing KCS corridor with benefits for passenger rail will help to preserve the rail corridor between College Street and Milam Street that crosses the existing Neches River rail bridge.
Transportation	Safety and Security	Safety	3	7	7	Increase number of grade separated crossings or improved at-grade rail crossing should help to improve safety. An increase in rail traffic along Long Avenue may increase the potential for accidents in this residential area. While potentially offset from grade separations, such structures add costs and have other property impacts.
		Security	3	5	5	Community access - more trains will mean a reduction in community access which will most likely be an issue along Long Avenue.
	Connectivity		5	5	5	Existing connectivity is maintained through use of the existing rail corridor. All three alternatives are equal in this matter.
	Congestion Relief	Rail Travel Times	3	5	3	Improved travel times equate to less congestion - but may be off set by increased train traffic.
		Grade Separations	3	7	7	Reduced number of at grade crossings should help to relieve congestion.
	System Capacity	River Crossing Capacity	5	7	5	All alternatives increase capacity; perhaps the lift bridge alternatives less so than the stationary span
		Track Capacity	5	5	5	The "build" alternatives were specifically developed to provide an equal and comparable set of capacity improvements.
		Improved Signaling	3	3	3	Improved signalling is inherently provided within the rail network improvements. All three alternatives are equal in this matter.
Implementation	Cost Effectiveness	Cost Benefit	5	4	3	The overall cost effectiveness of any of the alternatives assessed is weakened by the operational analysis for the projected train volumes. While relative comparisons can be made amongst the alternatives, it can also be said that none of the alternatives achieve an adequate operation.
	Project Development	What stage is project at?	3	3	3	Each of the "build" alternatives is at the same stage of project development.
		Land Acquisition	3	7	7	The new alignment alternatives impact the largest number of parcels. In both cases the majority of these parcels appear to be privately owned. Both new alignment options also impact residential properties; but, also a relatively large number of parcels that are vacant / open space. These two alignments also have a high assessed valuation.
	Partnerships	Partnerships	5	7	7	The two new alignment alternatives require additional partnering efforts to determine ownership, maintenance, operational and financial structure and organization.
	Innovation	Technological	3	5	3	The high-level navigational clearance over the Neches River for a fixed bridge will result in structurally significant element on the landscape.
		Institutional	3	7	5	Construction adjacent to the existing railroad maintains the institutional status quo. The new alignments would require discussing a potentially new organization structure.

Legend  
10 = Exceptional level of impact/benefit  
7 = Significant level of impact/benefit  
5 = Moderate level of impact/benefit  
3 = Minor level of impact/benefit  
0 = No level of impact/benefit

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